PHYSICIAN REQUIREMENTS-1990

NEWARK PUBLIC LIBRARY

MAR 1 1 1982

U. S. GOVT. PUBS.
DEPOSITORY 376

For Nephrology

OFFICE OF
GRADUATE MEDICAL EDUCATION

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration

024:

READEX FICHE best copy available

PHYSICIAN REQUIREMENTS-1990

For Nephrology

Joan K. Rosenbach, Ph.D.

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service
Health Resources Administration
Office of Graduate Medical Education

DHHS Publication No. (HRA) 82-621

blank page

FOREWORD

This document was developed by the Office of Graduate Medical Education (OGME) in follow-up of the deliberations of the Graduate Medical Education National Advisory Committee (GMENAC) and the Nephrology Delphi Panel convened on its behalf.

The purpose of this enterprise was to provide exposition and an updated refinement of the GMENAC estimate of physician workforce requirements for 1990. GMENAC was chartered by the Secretary of Health, Education, and Welfare (currently Department of Health and Human Services) in 1976 to provide recommendations regarding changes in graduate medical education likely to achieve a balance in the specialty and geographic distribution of physicians, according to estimated needs of physician services. One of a series of specialty-specific monographs, this paper should serve as a resource to professional organizations, governmental planners and other groups of health policymakers in developing guidelines for graduate medical education, and planning for equitable access to health services for all segments of the United States population.

Jerald Katzoff, Chief of the Research and Analysis Branch of OGME, and F. Lewis Aumack, Social Science Analyst, were responsible for developing and organizing the materials and methodology which served as a basis for the entire study. In addition, F. Lewis Aumack had lead responsibility in coordinating the Delphi Panel groups and tabulating the results. Cheryl Birchette-Pierce served as coordinator for the dialogue with subspecialty organizations, and was involved in the collation and drafting of materials for this monograph series. Itzhak Jacoby, the former Director of OGME, was responsible for the initiation of the effort.

Comments regarding this monograph may be sent to the Office of Graduate Medical Education at the Center Building, Room 10-30, 3700 East-West Highway, Hyattsville, MD 20782.

Marjorie A. Bowman M.D.

Marjorie A. Bowman, M.D.
Director
Office of Graduate Medical Education

ACKNOWLEDGMENTS

Several individuals contributed significantly to the development of this monograph. These include current and former members of the staff of the Office of Graduate Medical Education (OGME). Barry Greengart provided computer assistance, Edna Simon provided valuable editorial assistance, and Eleanor Wesolowski was prodigious in her review of the reference section. Catherine Alexander, Carolyn Conrad, Beverly Leasiolagi, Mickey Reed, Ramona Scott, and Brenda Stansbury of the secretarial staff were patient and diligent in their provision of support services. Sherry Whipple, administrative assistant, was responsible for coordinating and arranging the series of panel meetings which were conducted during the project.

In addition, Christopher Blagg, Vardaman Buckalew, Jr., and Martin Rappaport, members of the Nephrology Delphi Panel, were an invaluable resource for determining the needs for this specialty.

TABLE OF CONTENTS

	Page
FOREWORD	iii
ACKNOWLEDGMENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vi
I. INTRODUCTION	1
Historical Perspectives of The Graduate Medical Education National Advisory Committee (GMENAC)	
Reference Data Sources	
The Specialty of Nephrology: An Overview	
II. ANALYSIS AND DISCUSSION	20
Results of Research and Delphi Process	
Comparison of 1990 Practice Profiles to 1977 Practice Profiles for Nephrology	
Effects of a Specialty Oversupply	
Unresolved Issues	
III. IMPLICATIONS AND MAJOR CONCLUSIONS	39
IV. RECOMMENDATIONS	41
V. FUTURE DIRECTION OF NEPHROLOGY WORKFORCE REQUIREMENTS	42
VI. APPENDIXES	
1. Abbreviations	43
2. Members of Graduate Medical Education National Advisory Committee	45
3. Members of Graduate Medical Education National Advisory Committee Modeling Technical Panel	53
4. Members of Graduate Medical Education National Advisory Committee Adult Medical Care	55
5. Members of Graduate Medical Education National Advisory Committee Nephrology Delphi Panel	57
6. Procedure for Calculating Internal Medicine Subspecialty Ambulatory Requirements	59
7. Abbreviations for Adult Medical Care Data	62
8. Ambulatory Adult Medical Care Data: Nephrology - Part I	64
9. Ambulatory Adult Medical Care Data for Nephrology-Part II	75
10. Footnotes to Ambulatory Medical Care: Nephrology	86
11. Hospital Adult Medical Care Data: Nephrology	90
12. Footnotes Hospital Adult Medical Care Data: Nephrology	103
REFERENCES	106

LIST OF TABLES

Page

1. Percentage Distribution of Ambulatory Visits to Nephrologists for all Condition Groupings (1990), as Determined by Nephrology Delphi Panel..... 2

2. Disease Prevalence Changes to Ambulatory Reference Data, as Determined by Nephrology Delphi Panel..... 2

3. Percentage Distribution of Incidence/Prevalence Rates (1977-1990), as Determined by Nephrology Delphi Panel..... 2

4. Ambulatory Visits to Nephrologists and Nonphysician Providers for 1990, as Determined by Nephrology Delphi Panel..... 2

5. Comparison of Hospital Discharge Rates From Hospital Discharge Survey, and 1977 and 1990 Rates, as Determined By Nephrology Delphi Panel..... 2

6. Distribution of Hospital Requirements of Nephrology Physicians, as Determined by Nephrology Delphi Panel..... 28

7. Average Length of Stay by Patients Seen by Nephrologists and Average Number of Visits by Nephrologist (1990), as Determined By Nephrology Delphi Panel..... 3

8. Summary of Nephrology Requirements For 1990..... 3

9. Comparison of 1990 GMENAC Service Requirements to Current Practice Profiles for Nephrology, by Condition Grouping..... 3

LIST OF FIGURES

1. Generic Adjusted Needs-Based Model Used by Specialty Delphi Panels to Estimate Professional Requirements for 1990.....

2. GMENAC Requirements: Decision Levels.....

3. Conceptualization of the Nephrology Ambulatory Care Model.....

4. Nephrology Hospital Care Model.....

I. INTRODUCTION

HISTORICAL PERSPECTIVES OF THE GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE (GMENAC)

Over the past several decades, there has been a growing concern among the medical community, policymakers, and the public at large about the ability of the Nation to meet its health care needs. Initially, this took expression as a fear that a shortage would result from the combined effects of advancing medical knowledge, specialization, urbanization, and rising demand caused by greater public awareness. To offset the perceived shortage, many government programs were instituted in the 1960s to increase the supply of physicians.

Gradually, however, there grew an awareness that the problem was not so much one of undersupply as it was one of maldistribution of physicians, both by geographic area and by specialty, and that expanding the supply of physicians would not solve the problems related to poor distribution. As concern about the physician maldistribution grew in the 1970s, many people in both government and the private sector debated the programs and policies that should be pursued in the future to assure that the health care needs of the public would be best served. These debates were of great concern when the Comprehensive Health Manpower Training Act of 1971 (P.L. 92-157) expired in 1974. Two years of continued national debate ensued. Several proposals were made to regulate the number and distribution of residency training programs and positions in an effort to correct the perceived physician specialty maldistribution. During these debates, the Secretary of the Department of Health, Education, and Welfare (DHEW) 1/ submitted a plan to establish an "Advisory Council on Graduate Medical Education," using existing authority under section 222 of the Public Health Service Act. The culmination of these debates was the Health Professions Educational Assistance Act of 1976 (P.L. 94-484).

FUNCTIONAL CHARGE

The task of alleviating maldistribution thus fell to the Secretary of the U.S. Department of Health, Education, and Welfare, who chartered the Graduate Medical Education National Advisory Committee (GMENAC) on April 20, 1976. The charter, originally due to expire on April 20, 1978, was extended to April 30, 1980 and then again to September 30, 1980. The Committee consisted of 19 representatives from the private sector (13 physicians, 2 nurses, 2 attorneys, 1 hospital administrator, and 1 economist) and 3 ex officio Federal agency members. A roster of the GMENAC members is in Appendix 2.

1/ As a result of the creation of the Department of Education in May 1980, the Health and Welfare components of DHEW became the Department of Health and Human Services (DHHS).

As stated in the "Interim Report" (Department of Health, Education, and Welfare, 1979), the primary purposes of the Committee were to make recommendations to the Secretary regarding physician specialty and geographic distribution, and methods to finance graduate medical education. The Committee chose 1990 as its target date for the following reasons: (1) it was estimated that 30 percent of the current supply of physicians will have been replaced due to retirement, death, or other causes; and (2) 40 percent of the physicians will have been trained since 1976, the inception of the GMENAC's work. Thus, the opportunity would exist to effect change and assess the Committee's efforts.

STRATEGIES FOR ANALYSIS

To fulfill its charter purposes, GMENAC directed its analysis along three directions: (1) data analyses, (2) constitution of Technical Panels of Inquiry, and (3) models for forecasting future physician supply and physician requirements. For the most part, this monograph will deal with the third strategy for analysis. A few comments about the first two will, however, serve to provide a perspective of the total process.

Data Analyses: Overall Physician Supply and Workforce Modeling in Nephrology

The Committee examined data available on students, interns, residents, and practitioners in both osteopathic and allopathic medicine. A detailed analysis of this data will be found in the Report of the Graduate Medical Education National Advisory Committee to the Secretary, September 1980, Volume One.

The following are a few highlights of current and projected overall physician supply and workforce modeling in nephrology:

- The Nation's overall supply of active physicians is expected to continue to grow rapidly.
- The overall supply of active physicians will outpace U.S. population increases, so that the ratio of physicians to population will also rise.
- The number of physicians in primary care specialties is projected to increase relative to the total population.
- The higher ratio of physicians to population is expected to encourage primary care physicians to offer expanded hours of service in order to meet the competition of colleagues.
- The overwhelming contribution to nephrology practice involves dialysis for patients with chronic renal failure, including those requiring long term care and those awaiting transplants. The extent of this function is heavily reinforced and expanded by Federal reimbursement policies and procedures.
- Major biomedical breakthroughs in nephritis would impact heavily on this subspecialty, but none appear likely within the present decade.

- Delegability estimates of 50 percent for uremic disorders are predicated on an expanded availability and use of home and portable dialysis machines.

- Relatively high estimates of the percent of the nephrologist's practice that should be devoted to general medical care is related primarily to home visits to uremic patients. Due to the regularity of such visits over the course of time, nephrologists are in the best position, physically and psychologically, to care for other concomitant or emerging medical conditions.

The Five Technical Advisory Panels

GMENAC's second strategy for analysis resulted in the establishment of five technical advisory panels covering various issues. These were: (1) Modeling Research and Data, which provided direction to the modeling efforts, described below; (2) Financing, which examined the effects of different means of financing medical education, housestaff training, and delivery of services and the effect of each on distribution and geography; (3) Nonphysician Health Care Providers, which examined the role of nurse practitioners, physician assistants, and other providers and the implication of their existance on needs for certain categories of physicians; (4) Geographic, which examined the geographic and distributive considerations which need to be addressed to most effectively meet access problems related to both generalists and specialists; and (5) Educational Environment, which examined the impact of the institutional environments (medical school, teaching hospital) on specialty and geographic distribution of physicians. A full discussion of the work of the Technical Panels will be found in Volumes Two through Six of the Report of the Graduate Medical Education National Advisory Committee to the Secretary, September 1980. A summary of the major tasks of GMENAC is presented in Volume One of the Report.

The Generic Model

GMENAC's third strategy for analysis relates to determining the future need for physicians. A generic model was developed by the Committee for this purpose and is referred to as an "adjusted needs-based model" (see Figure I). Existing epidemiological data and hospital utilization data were used as a starting point in determining service requirements or needs. Data on conditions that were known to be treated by physicians in a given specialty or specialty group were selected based on analyses of current practice content by self-designated specialists and estimates of the training content in each specialty. These data were adjusted by panels of experts to take account of poorly measurable variables. Panels of experts provided their advice at the points in Figure I shown as "P" using a modified Delphi process to reach consensus. A full discussion of the generic model may be found in the Interim Report of the Graduate Medical Education National Advisory Committee to the Secretary (HRA) 79-633, and Volumes One and Two of the Report of the Graduate Medical Education National Advisory Committee to the Secretary.

Figure 1: Generic Adjusted Needs-Based Model Used by Specialty Delphi Panels to Estimate Professional Requirements for 1990

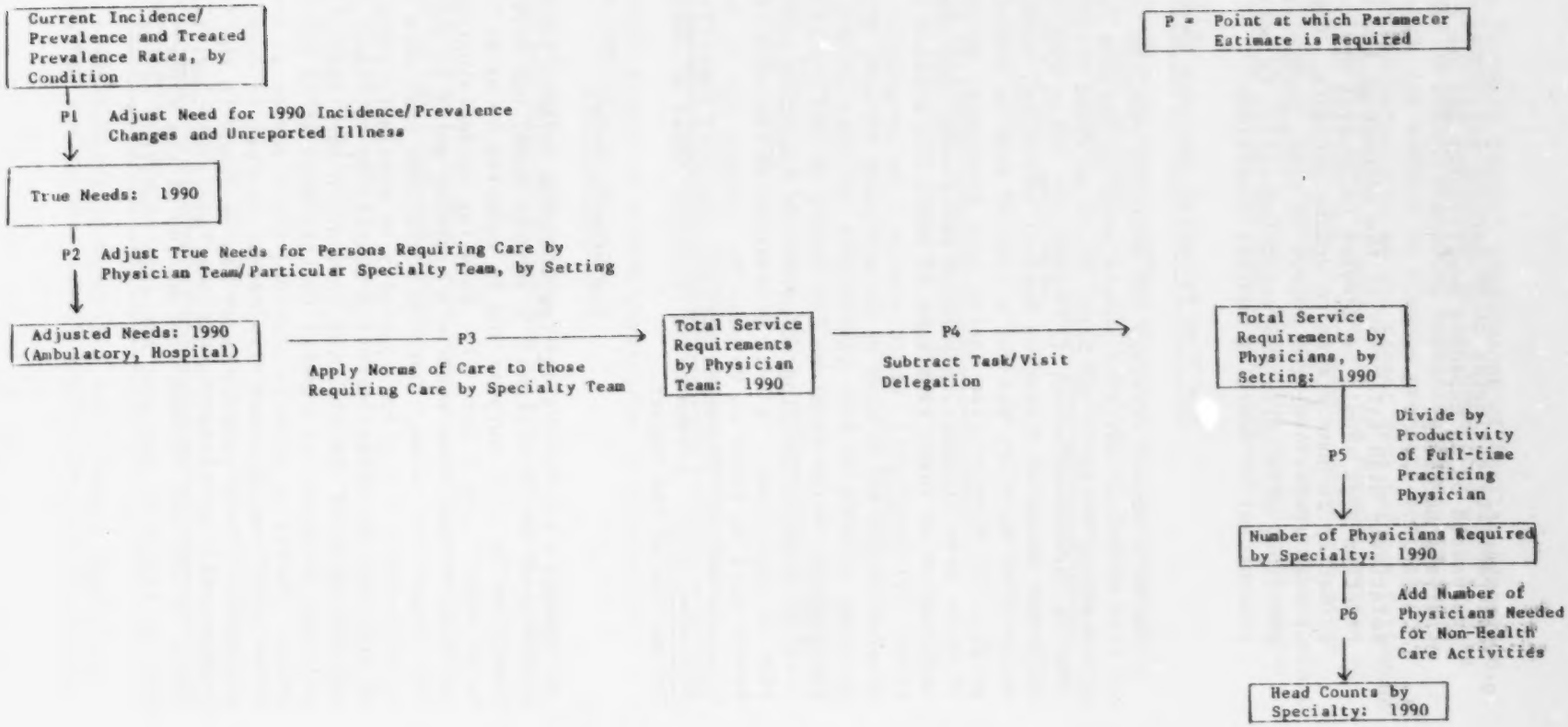

Current Incidence/ Prevalence and Treated Prevalence Rates, by Condition
P = Point at which Parameter Estimate is Required
P1 Adjust Need for 1990 Incidence/Prevalence Changes and Unreported Illness
True Needs: 1990
P2 Adjust True Needs for Persons Requiring Care by Physician Team/Particular Specialty Team, by Setting
Adjusted Needs: 1990 (Ambulatory, Hospital)
P3
Apply Norms of Care to those Requiring Care by Specialty Team
Total Service Requirements by Physician Team: 1990
P4
Subtract Task/Visit Delegation
Total Service Requirements by Physicians, by Setting: 1990
P5
Divide by Productivity of Full-time Practicing Physician
Number of Physicians Required by Specialty: 1990
P6
Add Number of Physicians Needed for Non-Health Care Activities
Head Counts by Specialty: 1990

FIGURE I (Continued)

P1 - True need was based on changes made to existing epidemiologic data.

P2 - Adjusted need was based on the percentage of true need requiring health care which should be handled by a particular specialty.

P3 - Norms of Care were described in terms of visits for each specialty.

P4 - Delegation was determined in terms of the percentage of visits to the specialty team which should accrue to nonphysician health care providers.

P5 - Productivity of specialists was determined in terms of number of visits provided within a week, and hours spent in patient care. Productivity data on specialists should be adjusted for changes ensuing as a result of utilization of services, other than direct visits, provided by nonphysician health care providers.

P6 - Calculation of workforce requirements made by changing FTE requirements into total requirements based on the proportion of a specialist's workload devoted to nonhealth care activities (e.g. teaching, research, administration).

The Requirements Modeling Process and Its Limitations

A panel of expert consultants, the Delphi Panel, was selected from a list of nominees and provided with briefing materials. Although staff had the major responsibility for the design of the model and the selection of the ICDA codes to be considered by the Delphi Panel, the panelists had very significant input. They refined the model and reviewed the selected ICDA codes making additions, deletions, and combinations which they considered appropriate. The Delphi Panel then made the appropriate estimates needed to implement the model and the results of their deliberations were presented to the Modeling Panel for its consideration. The Modeling Panel endorsed the Delphi Panel recommendations, making modifications, and then presented them to the GMENAC at a plenary session. Figure II traces these decision levels. The requirements for nephrology were thus deliberated and adopted in the public arena. Members of the Modeling Panel and Nephrology Delphi Panel are listed in Appendixes 3 and 4, respectively.

Although the process by which the nephrology physician requirements was modeled has provided an estimate of the Nation's physician requirements for 1990, it has not afforded conclusive answers to all questions pertaining to requirements for this specialty. The limitations inherent in the modeling process preclude such definitive determinations. Although an attempt was made to assess the impact of technological advances in nephrology, there is no way to measure the accuracy of these predictions. Advances in nephrology may well extend the life span of the end-stage renal disease patient, resulting in the need for more visits per patient. Additionally, advances in other specialties may further extend the life span of the general population, with an increase in the number of people becoming nephrology patients.

Although the Delphi Panel was provided with the most complete data available, it was recognized that it was not without limitations. It must be recognized that the GMENAC effort represents an advance in workforce planning but that further studies must be conducted to validate its results and to extend knowledge in the field.

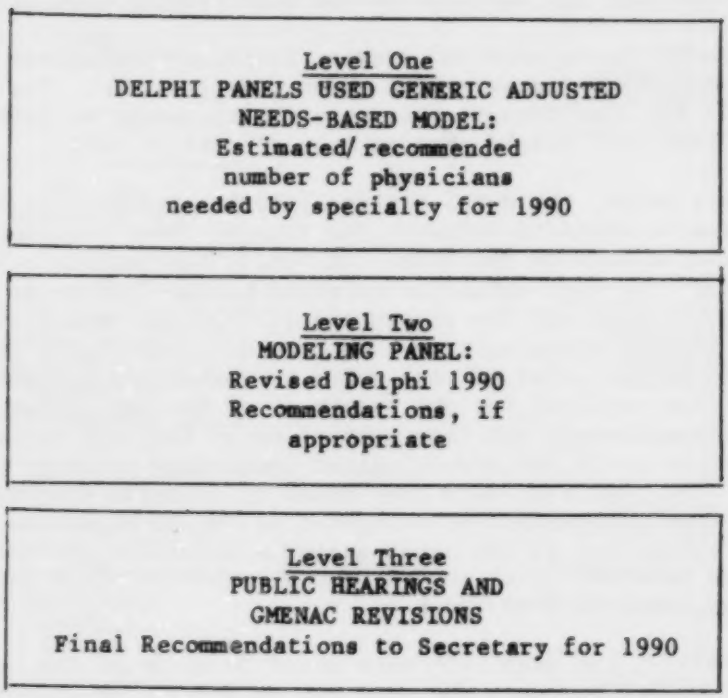
Nephrology Models

At the time the generic model was conceptualized, it was recognized that it could not be fully implemented by each specialty, but that a series of closely related models would be developed. In the case of nephrology, two related models were developed -- one for ambulatory care and one for hospital care. Like the generic model which they parallel, the nephrology model is ICDA specific and uses the Delphi Panel to provide advice at each point.

Service requirements for ambulatory and hospital care are additive. Nonetheless, it is possible to estimate total workforce requirements by considering only one or the other of the service requirement components in isolation. In order to estimate total workforce requirements using only part of the service requirements (i.e. ambulatory vs. hospital care), it is only necessary to know what proportion of the total care the "missing" element represents. Then the productivity parameter can be adjusted so that it represents only that portion of the care that could

FIGURE II

GMENAC REQUIREMENTS DECISION LEVELS



be provided in a work week, divided between both components of care. For example, in the case of nephrology the average physician's total visit productivity was divided between ambulatory and hospital care in the ratio 65:35. By deflating productivity by 35 percent, the total workforce requirements were estimated by explicitly examining only ambulatory care. The same procedure was applied to the hospital care model, estimating total workforce requirements by explicitly examining only hospital care.

Ambulatory Care Model

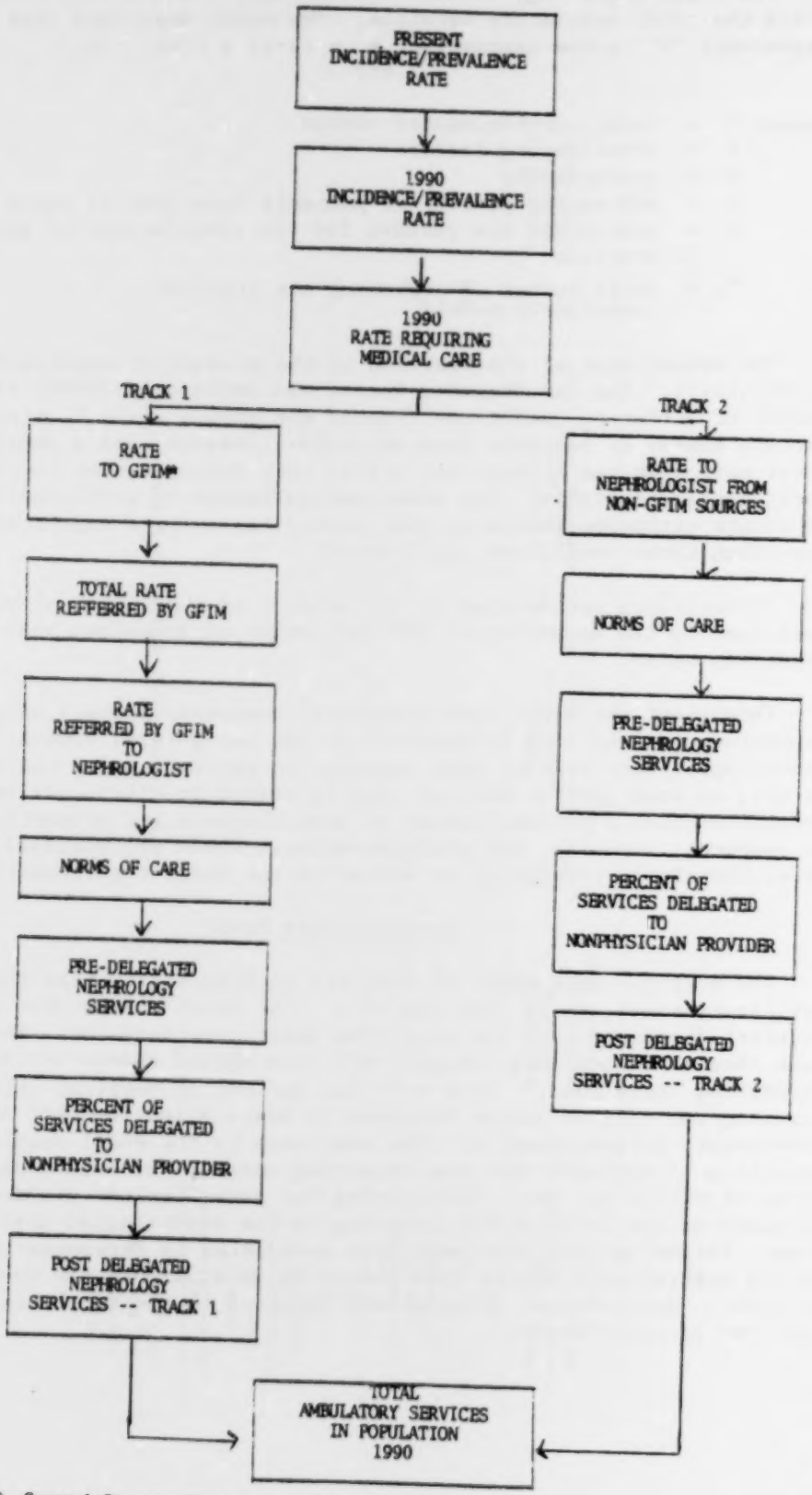
As noted in Figure III, the ambulatory care model for nephrology consists of two tracks. Track 1 estimates the services provided to patients referred to the nephrologist by the general practitioner, family practice physician or general internal medicine physician (a group henceforth referred to as "GFIM"). Track 2 estimates the services provided to patients who were not referred to the nephrologist from GFIM sources.

The model starts with the present incidence/prevalence rate per 100,000 population for each ICDA under consideration. The panelists were then asked how they thought this rate should change by 1990 and to estimate the rate that should require medical care in 1990.

At this point, the model divides into two tracks. In Track 1, the panelists were asked to estimate the rate of those requiring health care that should be seen by the GFIM. Of these, the panelists were asked to predict the rate that should be referred by the GFIM to an internal medicine subspecialist and the percentage of that rate which should be referred to the nephrologist, in particular. The figure thus derived was multiplied by the norms of care which the panelists estimated as the number of visits required for the treatment of the particular ICDA. The product of these factors was then multiplied by the 1990 estimated adult population to yield the pre-delegated hematology/oncology services from Track 1. The panelists were then asked to estimate the percent of nephrology services that should be delegated to the nonphysician provider. This was then multiplied by the total estimate of visits pre-delegated and then subtracted from the total pre-delegated visits to yield the post-delegated nephrology services from Track 1.

In Track 2, the panelists were asked to estimate the rate of those requiring nephrology care who were not referred from GFIM sources. This figure was then multiplied by the norms of care and the population factor, as in Track 1, to yield the pre-delegated nephrology services from Track 2. The percent delegation was then applied and subtracted from the pre-delegated estimate to yield the post-delegated services from Track 2.

FIGURE III
CONCEPTUALIZATION OF THE NEPHROLOGY AMBULATORY CARE MODEL


PRESENT INCIDENCE/PREVALENCE RATE
1990 INCIDENCE/PREVALENCE RATE
1990 RATE REQUIRING MEDICAL CARE
TRACK 1
TRACK 2
RATE TO GFIM*
TOTAL RATE REFFERRED BY GFIM
RATE REFERRED BY GFIM TO NEPHROLOGIST
NORMS OF CARE
PRE-DELEGATED NEPHROLOGY SERVICES
PERCENT OF SERVICES DELEGATED TO NONPHYSICIAN PROVIDER
POST DELEGATED NEPHROLOGY SERVICES -- TRACK 1
RATE TO NEPHROLOGIST FROM NON-GFIM SOURCES
NORMS OF CARE
PRE-DELEGATED NEPHROLOGY SERVICES
PERCENT OF SERVICES DELEGATED TO NONPHYSICIAN PROVIDER
POST DELEGATED NEPHROLOGY SERVICES -- TRACK 2
TOTAL AMBULATORY SERVICES IN POPULATION 1990

* General Practice/Family Practice/Internal Medicine.

The total nephrology services from Tracks 1 and 2 were then summed to yield the total ambulatory services. The model described thus far represents "V" in the expression $\frac{V}{S \times P} \times (1+C) \times (1+G) = N_a$

where: V = total, non-delegated visits
S = simultaneity factor
P = productivity
C = add-on for percent of patients less than 17 years of age
G = add-on for the percent for the requirements of general practice
N_a = total number of nephrologists required (ambulatory model)

The denominator of the fraction is the product of simultaneity and productivity. The simultaneity factor was defined by GMENAC as "average number of different conditions treated per office visit." Since a certain number of patients have multiple illnesses, and a physician can treat more than one illness per visit, this factor serves to reduce the total number of visits. The simultaneity factor of 1.90 that the panelists estimated indicates that within two average ambulatory visits more than three conditions are treated.

Productivity was defined as the product of the number of visits per week seen by the nephrologist and the number of weeks per year that physician works.

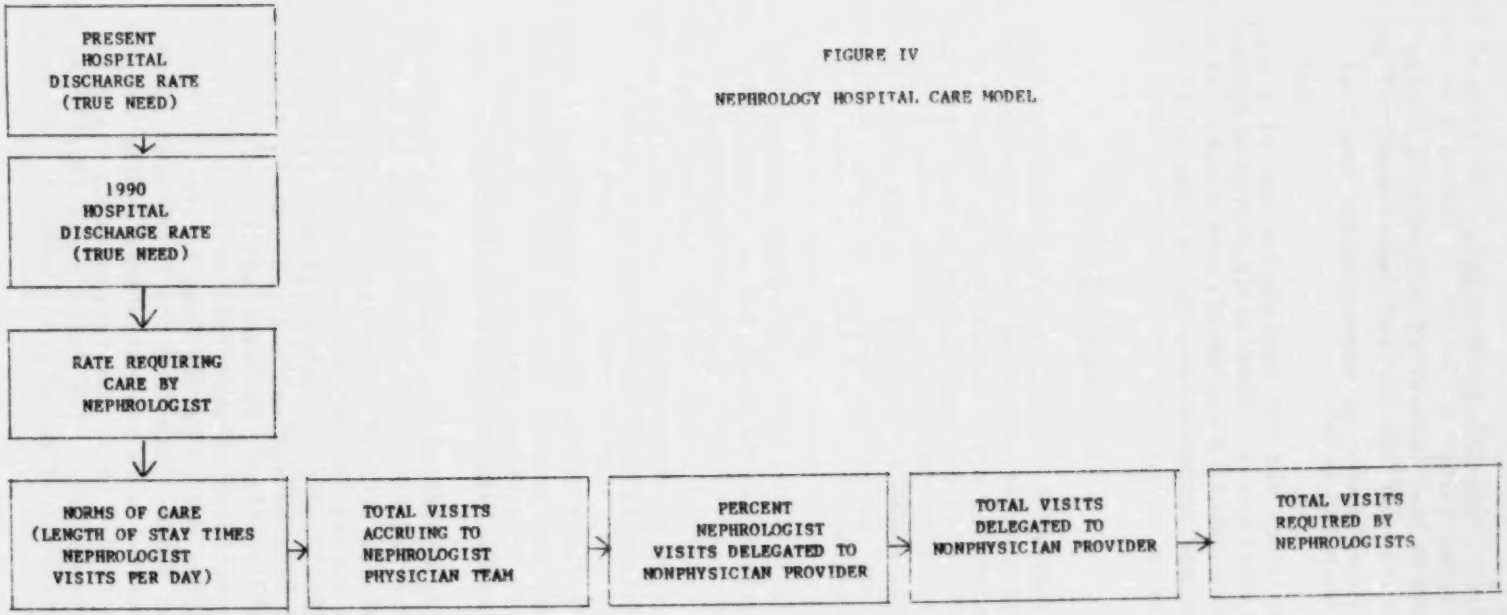
Throughout the model, the panelists' responses assumed only direct nephrology patient care to adults. It was recognized, however, that the nephrologist does deliver some services to patients under the age of 17, as well as some general medical care in normal practice. It was also recognized that a certain number of nephrologists are primarily involved in research, teaching, and administration. These professional activities were, therefore, treated as an add-on to the basic requirements.

Hospital Care Model

The hospital care model is depicted in Figure IV. Like the ambulatory model, it is ICDA specific. The model starts with the present hospital discharge rate for each ICDA under consideration. The panelists were then asked how they thought this rate should change by 1990, thus estimating "true need." True need was defined as hospital utilization assuming not only no access barriers to hospitalization, but also no unnecessary hospitalization. The next step in the model required the panelists to estimate the rate requiring care by the nephrologist in terms of visits per day. Multiplying the above factors yielded an estimate of the total visits accruing to the nephrologist physician team. Following this, the panelists were asked to determine the percent of the nephrologist visits that should be delegated to the nonphysician provider. Mathematical calculations resulted in the total visits required by nephrologists.

FIGURE IV

NEPHROLOGY HOSPITAL CARE MODEL


PRESENT HOSPITAL DISCHARGE RATE (TRUE NEED)
1990 HOSPITAL DISCHARGE RATE (TRUE NEED)
RATE REQUIRING CARE BY NEPHROLOGIST
NORMS OF CARE (LENGTH OF STAY TIMES NEPHROLOGIST VISITS PER DAY)
TOTAL VISITS ACCRUING TO NEPHROLOGIST PHYSICIAN TEAM
PERCENT NEPHROLOGIST VISITS DELEGATED TO NONPHYSICIAN PROVIDER
TOTAL VISITS DELEGATED TO NONPHYSICIAN PROVIDER
TOTAL VISITS REQUIRED BY NEPHROLOGISTS

The model described thus far represents the term "V" in the expression of $\frac{V}{P} \times (1+C) \times (1+G) = N_h$

where: V = total, non-delegated visits
P = productivity
C = add-on for percent of patients less than 17 years of age
G = add-on for the percent requirements of general practice
N_h = total number of nephrologists required (hospital model)

The hospital model did not include the use of a simultaneity factor because the hospital model relied on discharge diagnoses rather than on total diagnoses, as used in the ambulatory model. As in the ambulatory care model, services to patients under the age of 17 and general medical care were treated as add-ons.

Delphi Process

As in each specialty studied, a Delphi Panel of experts was selected for nephrology to provide advice on the application and implementation of an appropriate model to use in developing professional requirements for nephrology. Because of the constraints of time, the panelists were selected from a list of GMENAC nominations. The Nephrology Panel consisted of three members: One was a practitioner and two were academicians as well as practitioners. A roster of the Nephrology Delphi Panel is in Section 4.

The Panel engaged in a modified Delphi process. As noted by Delbecq et al. (1975), Delphi may be described as a method for structuring a communication process so that a group of individuals may effectively make judgments about complex issues. Delphi has been applied to a variety of situations requiring group communication, including situations whose principal purpose was classification and prediction.

During Delphi Panel deliberations, participants usually exchange views and comments anonymously through written materials. Anonymity protects the group from being dominated or influenced by strongly articulated positions, aggressive personalities, or peer pressure.

In determining workforce requirements, the Nephrology Panel's utilization of the Delphi was in modified form as was the utilization by the other specialties studied. The Delphi was divided into three phases which took place during two two-day meetings, separated by a phase which took place by mail. The first phase explored the subject being studied. The participants studied and refined the models, became acquainted with the reference data utilized, and made adjustments to the ICDA selections for study. The participants were then asked to individually complete their questionnaires and to return them to the staff for compilation. During the second phase, data from the first meeting were mailed to the participants, together with the calculated median responses. The panelists then returned their new responses to staff for compilation and calculation of new medians. The third phase identified areas of agreement and disagreement among group members. An attempt was made to

reduce variance in panel estimates with the aim of inserting the consensus or median estimates into the models so that nephrology professional requirements could be derived.

The modified Delphi, which was used in the study of nephrology offers several advantages as a method of obtaining expert opinion over the traditional Delphi. It imposes a minimum burden of time and expense on participants, and reduces the number of group meetings, thus expediting the final result.

REFERENCE DATA SOURCES

The panelists were provided with several sources of reference data to aid them in their deliberations. In addition to the judgments of the Adult Medical Care Delphi Panel (AMC) and the Modeling Panel, they were provided with data from a number of studies.

Health Interview Survey

The Health Interview Survey (HIS) provides national data on the incidence of illness and accidental injuries, the prevalence of diseases and impairments, the extent of disability, the utilization of health care services, and other health related topics. The interviewees of this study are the patients themselves or their immediate family members. Because of technical and logistical problems several segments of the population are not included in the study. Persons excluded are: patients in long-term care facilities for the handicapped; persons on active duty with the Armed Forces; and persons who have died during the calendar year preceding the interview. The result is that the HIS data somewhat underestimate levels of disability and health services utilization when the total population is considered. Although the effect on nephrology may be minimal, it should also be noted that there is severe underreporting of certain diseases, such as essential benign hypertension. This latter problem stems from varying prevalence estimates on patient as opposed to physician reported measures. Previous studies have indicated that patients often do not know, or deliberately hide, the precise diagnoses of their conditions.

Standards For Good Medical Care

The Standards for Good Medical Care (Schonfeld) survey utilized peer judgments by a sample of physicians concerning various aspects of standards for good medical care. These judgments pertained to contacts and encounters in relation to location, such as office or hospital, the number and purpose of the visits, as well as the required hospitalization days and desirable specialist referrals. An important aspect of the study is that it focuses on what should be the standards for good medical care rather than on the present situation as it exists. Schonfeld data having particular relevance to the nephrology study include norms of care and the percentage of patients which should be referred to the specialty from the generalist within one year.

Several limitations of the study should be noted. A serious deficiency of the study is that only 242 diseases were studied. As a result, there were no data for many of the ICDA codes considered by the

panelists. A related disadvantage for these deliberations resulted from the variations in the specificity of the disorders considered. Sometimes the Schonfeld study used a 4-digit ICDA, sometimes a 3-digit, and at still other times a composite across the entire classification system was used. The study specified 87 referral specialties and subspecialties. This also presented some difficulties for the deliberations of the Nephrology Panel. Nephrology was listed as one of 87 referral specialties, but no referrals were found for this specialty. Rather, referrals customarily expected for the nephrologist were indicated to be "Surgery, urological" (Table 14). Still, another limitation of the Schonfeld study is the relatively small sample of primary physician internists interviewed. The median number of judges across all adult diagnoses was less than two.

Hospital Discharge Survey

The Hospital Discharge Survey (HDS) produces statistics that are representative of the experience of the U.S. civilian population discharged from short-term hospitals. The survey provides information on the characteristics of patients, the lengths of stay, discharge diagnoses and surgical operations and patterns of use of care in hospitals of different size and ownership in the four regions of the country. The scope of the HDS is limited to discharges from non-Federal hospitals in the 50 States and the District of Columbia. Only short-stay hospitals with six or more beds and an average length of stay for all patients of less than 30 days are included in the study.

A serious limitation of the study is that only discharge diagnoses are listed, when in actual practice there may have been many diagnostic impressions of patients during their hospitalization, each of which may have required one or more visits from the subspecialist. Therefore use of the HDS as a reference implicitly assumes that the Delphi panelists were able to link discharge diagnoses with those diagnostic impressions subsumed in that hospital stay.

Profiles Of Practice

The American Medical Association data on Profiles of Practice are based upon questionnaire responses to 11,121 non-Federal office-based patient care physicians. Data were collected from October 1975 to February 1976 on their work patterns and practice characteristics. The data taken from the AMA survey relate to the questions on the productivity of physicians in both the ambulatory and hospital models. A serious limitation of the data source stems from the fact that the response rate of the survey was only about 50 percent. It has been hypothesized that the less busy physician is more heavily represented than the busier one. The data may, therefore, indicate a lower productivity rate than would be true if the sample were truly representative of the total physician population.

University of Southern California Nephrology Practices Study Report

University of Southern California, Nephrology Practice Study Report (USC-Mendenhall) is one study of a series that was conducted under contract to the Health Resources Administration. The reports describe the professional activities of subspecialists on a national basis. The studies, which present information describing patient volume, the specific characteristics of physician/ patient encounters, and the organization to the subspecialty practices, are based upon responses to a Log-Diary survey.

Several limitations of the Mendenhall data should be noted. There is a potential for observational bias, the extent of which is unknown. There is an undetermined number of diagnoses that were not reported in the study, and the possibility exists that this may represent selective reporting on the part of the respondents rather than an occasional (random) failure to report data. There is also a possibility that the time of year that the study was conducted may have an effect on the results, and therefore not representative of the typical practice of the nephrologist for the entire year. A further limitation of the data is that the estimates are only for the physician while at work. No adjustment was made for those who are on vacation or otherwise not professionally active, which may reasonably be expected to be about 8 to 12 percent. In addition, professional hours were entered into the Log-Diary by physicians in two different ways--over a full seven-day period and a designated three day period--and transformed into a "typical" day. The weekly hours may not be a simple function of a "typical" day multiplied by the number of days worked in a week.

The National Ambulatory Medical Care Survey

The National Ambulatory Medical Care Survey (NAMCS) is a national probability sample survey conducted annually by the National Center for Health Statistics to explore the provision and utilization of ambulatory care in the physician's office. It was designed and developed from 1966-1972 by a number of organizations and individuals in the medical community, the staff of National Center for Health Statistics (NCHS) and contractors with acknowledged expertise. The survey is performed on a sample of physicians in non-Federal, office-based practice and therefore do not include encounters taking place in hospitals, nursing homes, the patient's home, or other institutional settings. In addition, care provided by the physician on the telephone is not included. All specialties are included except the hospital-based specialties of anesthesiology, pathology, and radiology.

The questionnaire requests information from the provider on the following: date of visit; age; sex; race of patient; patient's principle problem(s), complaint(s), or symptom(s); major reason for the visit (i.e. whether acute or chronic, initial visit or follow-up, well care, family planning, counseling, referral, etc.); physician's principal diagnosis (ICDA) and other significant current diagnosis; diagnostic or therapeutic services rendered (18 categories listed); disposition of visit (eight categories listed); and duration of visit.

In 1977, of the 3,069 physicians who were eligible for the study, 80.5 percent responded. A total of 570.5 million office visits were reported. An estimate of 10 million extrapolated visits has a relative standard error of 7.5 percent (standard error of 750,000 visits).

When extrapolated nationally, NAMCS visit rates to physicians appear lower than HIS visit rates because they exclude telephone, clinic, hospital, and emergency room visits. However, in designating the specialty of the physician, NAMCS data are probably more accurate, because the provider rather than the consumer (who must rely on recall in filling out the questionnaire) supplies the information.

NAMCS data, which provide estimates of the percentage of ambulatory visits made to a particular specialist for all conditions, were used as reference material for the Delphi Panel to determine the percentage of need requiring medical care in the ambulatory setting by a particular specialist.

In addition, NAMCS data on the average number of visits provided for specific conditions by a particular specialist were used as reference material by panelists to develop norms of care.

THE SPECIALTY OF NEPHROLOGY: AN OVERVIEW

Certified Nephrologists

Nephrology is a subspecialty of internal medicine which focuses upon the kidney and genitourinary system. Certified nephrologists are physicians who are Diplomates in internal medicine, have taken an additional two years of training in a Nephrology program associated with an approved internal medicine residency program, and have passed the certifying examinations in Nephrology. When these examinations were instituted in 1972, 212 special certificates were awarded by the American Board of Internal Medicine. By 1980 this number had increased almost eightfold to 1,683 (Personal Communication. Benson, JA).

In addition, other physicians designate themselves as specialists in nephrology if they (1) have achieved training sufficient to become board eligible, or (2) have equivalent expertise derived from clinical practice dominated by patients afflicted with genitourinary disorder.

Nephrology Training Programs

There are limited data on the training programs in Nephrology. These are not residencies, but rather fellowships, and thus are not enumerated by the Accreditation Council for Graduate Medical Education. In addition they are not readily identifiable entities. In the 1976-1977 academic year it is estimated that there were 178 Nephrology fellowship programs in the United States, but by 1980-1981 there were 25 percent fewer programs. In 1976-1977 there was a total of 646 fellows in F1, F2, and F3. By 1980-1981, while F1 and F2 declined, F3, which is primarily a research year, more than doubled. During this same period foreign medical graduates (FMG) declined from 246, or 38.1 percent of total, to 127, or 24.3 percent of total (Personal communication. Schleiter MK).

Practice Profile

According to data obtained from the Nephrology Practice Study Report (Mendenhall, 1979) most nephrologists practice in the northeast, in metropolitan areas. Typically, they work an average of 53.8 hours per week, with inpatient and outpatient encounters about equal in number, and telephone encounters about one-third of the total inpatient and outpatient encounters. A unique aspect of the nephrologist's profile is that nearly six out of ten outpatient encounters occur in clinics-- usually dialysis units--representing approximately three out of ten of all encounters. These practitioners are relatively young, with only 15.8 percent 45 years or over, and predominantly male (96.4 percent).

DISEASES OF THE KIDNEY

There are two major categories of renal diseases: end-stage and other diseases of the kidney. Accurate data are not available on the number of patients with fatal and nonfatal kidney diseases, or on the costs to treat them.

Endstage Renal Disease

End-stage renal disease (ESRD) is chronic, progressive, kidney failure that is characteristically an irreversible process, resulting in the accumulation of metabolic substances in the blood and other body fluids. During the early stages of this illness it is managed by diet and medication. However, during the later stages when patients experience weakness, confusion, nausea, vomiting, fever, and signs and symptoms of toxic effects in almost every organ system, other treatments are indicated. The most common are dialysis and kidney transplants.

Kidney transplants originated during the 1950s, while hemodialysis was developed during the 1960s. Currently, nine-tenths of the patients with acute kidney failure are on dialysis (Health Care Financing Administration, 1980).

The primary causes of ESRD are glomerulonephritis, interstitial disorders, primary hypertensive disease, polycystic kidney disease, and diabetic nephropathy. While figures may vary for each of these diseases, depending upon the source of the data, about 80 percent of the cases are due to these five disorders. It is also estimated that between 40 percent and 50 percent of new ESRD patients are attributed to diabetes and hypertension. Data based on mortality figures suggest an incidence of 150 to 200 per million population. The rate seems to be higher for blacks than for whites (Burton, 1979).

Other Diseases of the Kidney

While end-stage renal disease has gained wide attention, approximately 20 percent of the deaths from kidney disease are due to urinary tract infection, neuromuscular disorders of bladder function obstruction, and stone disease. There are approximately 12 million people in the United States who are affected by these diseases each year (National Institute of Arthritis, Metabolism, and Digestive Diseases). They experience economic and social hardship due to time lost from work and the high cost of medical care.

Insight into the causes and development of these diseases is limited by the knowledge of the normal structure and function of the urinary system. Therefore, more research is needed to ascertain: (1) the causes of kidney stone formation, (2) the prevention of stone formation, (3) the prevention of bacterial colonization of the genitourinary tract, and (4) the prevention or amelioration of neuromuscular and obstructive disorders associated with renal diseases.

THE END-STAGE RENAL DISEASE PROGRAM: THE BENEFICIARY POPULATION

The End-Stage Renal Disease (ESRD) program was enacted in 1972 (PL 92-603) to save the lives of those patients with acute kidney failure. This unique program, which uses public funds (Medicare) to finance care of the catastrophically ill, regardless of age and income, was designed to serve an expected 7,000 dialysis patients at an estimated cost of $135 million. By the end of the first fiscal year, however, 15,000 patients had enrolled at a cost of $172 million (Matson, 1980). While no meaningful data exist, there have been an increase in the number of patients and the costs of the program.

From the program's inception until 1978, the number of beneficiaries receiving dialysis treatment had increased three-fold while the number receiving transplants was over 4,000 in 1979 (Health Care Financing Administration, 1980).

By 1978 the cost of the ESRD program reached almost $1 billion (Kolata, 1980). The cost of dialysis, the modality used to treat nine-tenths of the patients with end-stage kidney disease, was $149 per session for three or more sessions per week, or $25,000 annually. Kidney transplant surgery ranged from $19,000 to $26,000, plus followup costs (Matson, 1980). Congress enacted legislation (PL 95-292) to contain costs and to improve the quality of life for these patients. It provided payment for continuous ambulatory peritoneal dialysis (CAPD), encouraged kidney transplants, and fostered self-dialysis at home or at centers, rather than hospitals. Although there is a shortage of medical data on the ESRD program, one recent study on dialyzed patients suggests that a larger proportion are debilitated than was previously suspected (Gutman, 1981).

When the program was instituted, the average age of the patient was between 37 and 43, with fewer than 20 percent over age 50. By 1978 the average age was near 50, with 19 percent over the age of 65 (Kolata).

The percentage distribution by sex in 1978 was almost equally divided (men-49.2 percent; women-50.8 percent), with approximately one-fourth of the patients separated, divorced or widowed (Evans, 1981).

While entitlement is universal, there is great variation in the law's application geographically. In 1979 the dialysis rate was the highest in the District of Columbia (983 patients per million) and lowest in Wyoming (20 patients per million). The percentage of patients having home dialysis ranged from 0 to 59 percent. Kidney transplants ranged from 0 in some States to 122 per year per million population. Factors influencing the allocation of these health care resources have been explained through social, cultural, and economic factors, as well as differences in the incidence and prevalence rates and patient selection criteria (Relman and Rennie, 1980).

The quality of life is a major issue in the treatment of end-stage renal disease. Thus it becomes essential to have an adequate number of nephrologists engaged in research to discover the causes and ways to prevent this progressive disease in different patient populations and environments. Concomitantly, improved transplant technique and more readily available kidneys--cadaveric or donor--would not only improve the quality of life, but extend the life span of those who receive them. With the discovery of ways to improve matches from living donors, the survival rate for transplants is currently 60 to 75 percent (Matson, 1980). Recently the National Center for Health Care Technology set up a committee of outside experts to examine the ESRD Program. They will be concerned with the state-of-the-art as well as societal aspects.

NUMBER OF NEPHROLOGISTS: 1990

Nephrology workforce requirements for 1990 will be affected by developments in the treatment and prevention of end-stage renal disease as well as by developments in the treatment and prevention of other diseases of the kidney and genitourinary system.

To project the number of nephrologists that will be needed, the Graduate Medical Education National Advisory Committee and its Delphi and Modeling Panels reviewed available data. It estimated that there were 1,450 nephrologists in 1978 and determined that by 1990 the United States would require between 2,120 and 2,780 nephrologists. The following section analyzes and discusses these requirements.

II. ANALYSIS AND DISCUSSION

RESULTS OF RESEARCH AND DELPHI PROCESS

Ambulatory Requirements

Separate service requirements were calculated for the 34 major conditions treated in the office practice of a nephrologist. A detailed table containing data on each individual condition is presented in Appendixes 7 and 8.

Of major importance in the Nephrology Delphi Panel determinations was the role of generalists in the future. It was believed that they will be better trained and will therefore discover and refer more cases of essential benign hypertension (ICDA 401); acute nephritis (ICDA 580); nephrotic syndrome (ICDA 581); chronic nephritis (ICDA 582); nephritis, unqualified (ICDA 583); renal sclerosis, unqualified (ICDA 584); and diffuse diseases of the connective tissue (ICDA 734).

From Table 1 it can be seen that the Nephrology Delphi Panel determined that 98 percent of the ambulatory visits would be attributed to four condition groups: symptoms and ill-defined conditions (63.1 percent), diseases of the genitourinary system (10.6 percent), diseases of the circulatory system (4.4 percent), and general care (20.0 percent). Within the first group, symptoms and ill-defined conditions, uremia (ICDA 792) is the major condition, accounting for 11,434,443 visits. General care accounted for 3,626,965 visits. Of diseases of the genitourinary system, ICDAs 593, 594, 596 and 599 were the major conditions with 1,300,243 visits, while hypertensive disease accounted for the major portion of diseases of the circulatory system, with 668,647 visits.

The Delphi panelists estimated that a total of 14,507,858 visits by nephrologists would be required for the care of kidney related diseases. However, since nephrologists rarely treat only one specialty condition at a time, total visits accruing to the nephrologist were corrected for simultaneity. A correction factor of 1.90 was obtained and applied to the number of visits, which reduced service requirements, or visits, to 7,635,715.

To translate the service requirements into professional requirements, the visits were divided by the annual ambulatory productivity of the nephrologist. For ambulatory care the panelists estimated that the average nephrologist worked 48 weeks per year, including time allocated for illness, vacations, and holidays. The panel also suggested approximately 50 visits per week as the norm for 1990. Productivity was derived by multiplying 48 weeks times 50 visits per week and arriving at 2,400 visits per year which the average nephrologist would handle in 1990. Dividing the service requirements for Nephrology care by this factor results in a need for 3,182 patient care physicians in 1990 (Table 8).

TABLE 1: PERCENTAGE DISTRIBUTION OF AMBULATORY VISITS TO NEPHROLOGISTS (NE) FOR ALL CONDITION GROUPINGS (1990), AS DETERMINED BY NEPHROLOGY DELPHI PANEL

Condition Groupings	Percent of Total NE Ambulatory Visits
Infectious and Parasitic Diseases	**
Neoplasms	0.1
Endocrine, Nutritional, and Metabolic Diseases	1.1
Diseases of the Nervous System and Sense Organs	**
Diseases of the Circulatory System	4.4
Diseases of the Digestive System	**
Diseases of the Genitourinary System	10.6
--Infection of Kidney	(0.5)
--Calculus of Kidney and Ureter	(0.6)
--Other	(9.5)
Complications of Pregnancy, Childbirth, and Puerperium	**
Diseases of the Musculoskeletal System and Connective Tissue	0.4
Congenital Anomalies	0.1
Symptoms and Ill-Defined Conditions	63.1
--Uremia	(63.1)
--Other	(**)
Accidents, Poisonings, and Violence	0.1
TOTAL	79.9
General Care	20.0
GRAND TOTAL	99.9***

* Numbers do not reflect simultaneity factor, and refer to those 17 years of age or older.
** Less than 0.1 percent.
*** Does not equal 100.0 percent due to rounding.

The distribution of the nephrologist's services was estimated at 45 hours per week for patient care, with an additional 12 hours for other professional activities. The latter category included two hours for teaching, one hour for research, eight hours for administration, and one hour for continuing medical education.

Adjustments in Incidence/Prevalence Rates

The Delphi Panel made some adjustments in the expected prevalence rate from the 1977 reference data, because of limitations in the data sources. Downward adjustments were made for infectious and parasitic diseases, while upward adjustments were made in five condition groupings. The Nephrology Panel felt that the Health Inventory Survey data used underestimated prevalence data for diabetes mellitus, essential benign hypertension, diseases of the musculoskeletal system and connective tissue, and uremia (Table 2).

It was determined that three medical condition groups contributed almost 90 percent of the total incidence/prevalence for 1977. Diseases of the circulatory system were responsible for approximately one half, while endocrine, nutritional, and metabolic diseases and diseases of the genitourinary system were each responsible for approximately one fifth. It was estimated that these three groups would be responsible for similar proportions in 1990 (Table 3).

Decreases in five ICDA categories and increases in six ICDA categories were predicted by 1990. It was anticipated that there would be a 15 percent decrease in malignant neoplasms of the genitourinary organs in ICDA 189 and a 10 percent increase in neoplasms of the lymphatic and hematopoietic tissue, in ICDA 202. Changes were projected for endocrine, nutritional, and metabolic diseases in two categories: diabetes mellitus, ICDA 250, with an incidence/prevalence of 4,000 per 100,000 population in 1977 is expected to change to 4,400 per 100,000 population in 1990; gout, ICDA 274, with an incidence/prevalence of 1,080 per 100,000 population in 1977 is expected to decline to an incidence/prevalence of 1,026 in 1990. Essential benign hypertension, which accounts for approximately one half the incidence/prevalence of nephrological conditions will increase from 15,000 per 100,000 population to 16,500.

The prevalence rate was reduced for three other hypertensive diseases: malignant hypertension (ICDA 400), hypertension renal disease (ICDA 403), and hypertension heart and renal diseases (ICDA 404). The figures for cirrhosis of the liver (ICDA 571) are expected to increase from 144 per 100,000 population to 158. Uremia, ICDA 792, which had an incidence/prevalence rate of 35 per 100,000 population, is expected to have the greatest increase (33 percent).

The Nephrology Panel determined that all persons with nephrological conditions would require medical care, with the exception of those with certain symptoms and ill-defined conditions. It determined that only 90 percent of those cases in ICDAs 786 and 789 would require medical care.

TABLE 2: DISEASE PREVALENCE CHANGES TO AMBULATORY REFERENCE DATA, AS DETERMINED BY NEPHROLOGY DELPHI PANEL

Condition Groupings	1977 Reference Prevalence Data*	1977 Adjusted Prevalence Data*	1990 Expected Prevalence*
Infectious and Parasitic Diseases	21	17	17
Neoplasms	94	212	208
Endocrine, Nutritional and Metabolic Diseases	4,746	5,598	5,944
-- Diabetes Mellitus	(3,157)	(4,000)	(4,400)
-- Gout	(1,080)	(1,080)	(1,026)
-- Other	(509)	(518)	(518)
Diseases of the Nervous System and Sense Organs	141	141	141
Diseases of the Circulatory System Essential Benign	10,410	15,657	17,150
-- Hypertension	(9,756)	(15,000)	(16,500)
-- Arteriosclerosis	(583)	(583)	(583)
-- Other	(71)	(74)	(67)
Diseases of the Digestive System	144	144	158
Diseases of the Genitourinary System	5,202	5,202	5,202
-- Nephritis and Nephrosis	(85)	(85)	(85)
-- Infections of Kidney	(2,271)	(2,271)	(2,271)
-- Calculus of Kidney & Ureter	(464)	(464)	(464)
-- Other	(2,382)	(2,382)	(2,382)
Complications of Pregnancy, Childbirth and Puerperium	169	169	169
Diseases of Musculoskeletal System and Connective Tissue	298	340	340
Congenital Anomalies	131	131	131
Symptoms and Ill-defined Conditions	211	239	251
Accidents, Poisonings and Violence	2,109	2,109	2,109

*Rate/100,000 population

TABLE 3: PERCENTAGE DISTRIBUTION OF INCIDENCE/PREVALENCE RATES (1977 AND 1990) AS DETERMINED BY NEPHROLOGY DELPHI PANEL

Condition Groupings	1977 Incidence/ Prevalence (Rate/100,000)	1990 Incidence/ Prevalence (Rate/100,000)
Infectious and Parasitic Diseases	0.1*	**
Neoplasms	0.7	0.6
Endocrine, Nutritional, and Metabolic Diseases	18.7	18.7
-- Diabetes Mellitus	(13.4)	(13.8)
-- Diseases of Parathyroid Gland	**	**
-- Diseases of Pituitary Gland	**	**
-- Diseases of Adrenal Gland	**	**
-- Gout	(3.6)	(3.2)
-- Other	(1.7)	(1.6)
Diseases of the Nervous System and Sense Organs	0.5*	0.4
Diseases of the Circulatory System	52.3	53.9
-- Essential Benign Hypertension	(50.1)	(51.9)
-- Arteriosclerosis	(1.9)	(1.8)
-- Polyarteritis Nodosa and Allied Conditions	**	**
-- Other	(0.2)	(0.2)
Diseases of the Digestive System	0.5	0.5
Diseases of the Genitourinary System	17.4*	16.3
-- Infections of Kidney	(7.6)	(7.1)
-- Calculus of Kidney and Ureter	(1.5)	(1.4)
-- Other	(8.2)	(7.8)
Complications of Pregnancy, Childbirth, and Puerperium	0.6*	0.5
Diseases of the Musculoskeletal System and Connective Tissue	1.1*	1.1
Congenital Anomalies	0.4*	0.4
Symptoms and Ill-Defined Conditions	0.8	0.8
Accidents, Poisonings, and Violence	7.0*	6.6
GRAND TOTAL	100.1***	99.8***

* No change in rate anticipated for 1990.
** Less than 0.1 percent.
*** Does not equal 100 percent due to rounding.

Delegation of Ambulatory Nephrological Visits

Of the 26,165,185 visits to nephrologists, the Nephrology Delphi Panel determined that 11,657,328 visits, or 45 percent, would be delegated to nonphysician providers. Delegability estimates of 50 percent for uremic disorders are predicated on an expanded availability and use of home and portable dialysis machines. This condition constituted 98 percent of delegated visits, while essential benign hypertension constituted approximately 2 percent of delegated visits (Table 4).

Hospital Requirements

The Nephrology Delphi Panel believed that in 1990 there would be better drugs and treatment procedures; more accurate diagnoses and reporting of kidney infections; and a changed role for other specialists, such as primary care practitioners, with respect to kidney disease. Consideration of these factors impacted on their determinations.

Comparison of hospital discharge rates indicates that there was agreement between the HDS data and the Delphi Panel estimates for 1977 and 1990 with respect to the five major condition groupings of nephrological disorders. The rank order, however, differed. Beginning with the highest, the rank order for the HDS data was endocrine, nutritional, and metabolic diseases; neoplasms; diseases of the circulatory system; diseases of the genitourinary system; and accidents, poisoning and violence. For the Delphi Panel, for 1977, it was endocrine, nutritional, and metabolic diseases; diseases of the genitourinary system; neoplasms; diseases of the circulatory system; and accidents, poisoning, and violence. The Delphi Panel made no changes in rank order for 1990 (Table 5).

The Delphi Panel determined that the 1977 discharge rate should be higher than the HDS rate for three condition groupings: diseases of the genitourinary system, especially calculus of the kidney and ureter; complications of pregnancy, childbirth and puerperium; and congenital anomalies. Decreases were found in the other ten condition groupings, most notably in malignant neoplasms of the prostate, testes, and unspecified male genital organs (ICDA 185-187); diabetes mellitus (ICDA 250); hypertensive disease (ICDA 400-404); and adverse effects of medicinal agents (ICDA 960-979). The Nephrology Delphi Panel made only minor changes in the discharge rate for 1990.

Diseases of the genitourinary system, diseases of the circulatory system, and general care were projected to be responsible for approximately 80 percent of hospital requirements in 1990 (Table 6). Major contributing diseases were determined to be hypertensive disease (ICDA 400-404) with 1,852,435 visits, nephritis and nephrosis (ICDAs 580-584) with 1,200,896 visits, and other diseases of the kidney and ureter (ICDA 593) with 698,703 visits.

TABLE 4: AMBULATORY VISITS TO NEPHROLOGISTS (NE) AND NONPHYSICIAN PROVIDERS (NPP) FOR 1990, AS DETERMINED BY DELPI PANEL

Condition Groupings	Total Visits to NE Required (From all Sources)		Total Visits to be Handled by NE (Not Delegated)		Total Visits Delegated to NPP	
	Number*	Percent	Number*	Percent	Number	Percent
Infectious and Parasitic Diseases	337	**	335	**	2	**
Neoplasms	15,547	**	15,547	0.1	0	0
Endocrine, Nutritional, and Metabolic Diseases	202,078	0.6	202,078	1.1	0	0
Diseases of the Nervous System and Sense Organs	2,332	**	2,332	**	0	0
Diseases of the Circulatory System	1,016,777	3.1	793,895	4.4	222,883	1.9
Diseases of the Digestive System	1,106	**	1,106	**	0	0
Diseases of the Genitourinary System	1,927,075	5.9	1,927,075	10.6	0	0
--Infection of Kidney	(82,538)	(0.3)	(82,538)	(0.5)	(0)	(0)
--Calculus of Kidney and Ureter	(117,430)	(0.4)	(117,430)	(0.6)	(0)	(0)
--Other	(1,727,107)	(5.3)	(1,727,107)	(9.5)	(0)	(0)
Complications of Pregnancy, Childbirth, and Puerperium	7,707	**	7,707	**	0	0
Diseases of the Musculoskeletal System and Connective Tissue	76,490	0.2	76,490	0.4	0	0
Congenital Anomalies	16,023	**	16,023	0.1	0	0
Symptoms and Ill-Defined Conditions	22,877,061	69.9	11,442,618	63.1	11,434,443	98.1
--Uremia	(8,175)	(**)	(8,175)	(**)	0	0
--Other	(22,868,886)	(69.9)	(11,434,443)	(63.1)	(11,434,443)	(98.1)
Accidents, Poisonings, and Violence	22,652	**	22,652	(0.1)	(0)	(0)
TOTAL	26,165,185	79.6	14,507,858	79.9	11,657,328	100.0
General Care	6,541,296	20.0	3,626,964	20.0	0	0
GRAND TOTAL	32,706,481	99.6***	18,134,822	99.9***	11,657,328	100.0

* Numbers do not reflect simultaneity factor, and refer to those 17 years of age or older.
** Less than 0.1 percent.
*** Does not equal 100.0 percent due to rounding.

TABLE 5: COMPARISON OF HOSPITAL DISCHARGE RATES FROM HOSPITAL DISCHARGE SURVEY (HDS), AND 1977 AND 1990 RATES, AS DETERMINED BY NEPHROLOGY (NE) DELPHI PANEL

Condition Groupings	HDS Rate*	NE 1977 Discharge Rate*	NE 1990 Discharge Rate*
Infective and Parasitic Diseases	39.2	38.7	32.4
Neoplasms	377.4	346.6	336.9
-- Female Disorders	(132.2)	(132.0)	(132.0)
-- Male Disorders	(67.8)	(50.0)	(47.5)
-- Bladder/ other and unspecified Urinary Organs	(71.6)	(71.6)	(64.4)
-- Other	(105.8)	(93.0)	(93.0)
Endocrine, Nutritional, and Metabolic Diseases	446.5	392.2	398.3
-- Diabetes mellitus	(342.9)	(300.0)	(306.0)
-- Other	(92.2)	(92.3)	
Diseases of the Blood and Blood Forming Organs	40.4	40.0	40.0
Diseases of the Nervous System and Sense Organs	47.9	43.5	43.5
Diseases of Circulatory System	294.5	278.0	279.8
-- Essential Benign Hypertension	(194.8)	(180.0)	(181.8)
-- Arteriosclerosis	(62.9)	(63.0)	(63.0)
-- Other	(36.8)	(35.0)	(35.0)
Diseases of the Digestive System	65.3	65.0	(66.3)
Diseases of the Genitourinary System	284.9	373.0	373.0
-- Infection of Kidney	(69.1)	(75.0)	(75.0)
-- Calculus of Kidney and Ureter	(109.4)	(190.0)	(190.0)
-- Other	(106.4)	(108.0)	(108.0)
Complications of Pregnancy, Childbirth, and Puerparium	15.6	17.6	17.6
Diseases of the Musculoskeltal System and Connective Tissue	72.8	68.0	68.0
Congenital Anomalies	15.0	18.8	18.8
Symptoms and Ill-defined Conditions	45.4	42.0	42.0
Accidents, Poisoning, and Violence	199.2	184.5	186.0

* Per 100,000 population

TABLE 6: DISTRIBUTION OF HOSPITAL REQUIREMENTS OF NEPHROLOGY PHYSICIANS, AS DETERMINED BY NEPHROLOGY DELPHI PANEL

Condition Groupings	Percentage Distribution
Infectious and Parasitic Diseases	**
Neoplasms	1.8
Endocrine, Nutritional and Metabolic Diseases	7.5
Diseases of the Blood and Blood-Forming Organs	**
Diseases of the Nervous System and Sense Organs	**
Diseases of the Circulatory System	28.2
Diseases of the Digestive System	2.5
Diseases of the Genitourinary System	29.4
Complications of Pregnancy, Childbirth, and Puerperium	**
Diseases of the Musculoskeletal System and Connective Tissue	2.0
Congenital Anomalies	3.2
Symptoms and Ill-Defined Conditions	2.0
Accidents, Poisonings, and Violence	3.3
SUBTOTAL	80.0
General Practice *	20.0
GRAND TOTAL	100.0

* These figures account for 20 percent of the hospital practice of physicians specializing in Nephrology diseases not captured in specific primary diagnoses in the condition groupings cited above.

** Less than 0.1

The average length of stay by patients seen by nephrologists ranged from 3.5 days for ICDA 789, abnormal urinary constituents of unspecified cause, to 26.0 days for ICDA 421, acute and subacute endocarditis (Table 7).

The Delphi Panel recommended that the average number of visits by nephrologists per day should be 1.0 for all condition groupings except neoplasms where the range was 1.0 to 1.5, and accidents, poisonings and violence, where the range was recommended to be 1.0 to 1.2 (Table 7).

The Delphi Panel recommended that the total number of hospital visits by nephrologists in 1990 would be 5,735,095. None of the hospital care was thought to be delegable to nonphysician providers.

For hospital care, the percentages of categories of diseases recommended to be seen by the nephrologist which exerted a large effect on requirements were hypertensive disease (80 percent), nephritis and nephrosis (100 percent), other diseases of the kidney and ureter (80 percent), polyarteritis nodosa and allied conditions (80 percent), and cystic kidney disease (80 percent). It was also felt that the nephrologist should see all cases of a renal disease arising during pregnancy and puerperium as well as nearly all (95 percent) of the cases of uremia. It was felt that only 5 percent of the diabetes mellitus cases should be seen by the nephrologist, while the majority of such cases could be adequately managed by endocrinologists or generalists particularly skilled in treating diabetic complications.

Representatives of the internal medicine subspecialty panels agreed by a 9 to 1 vote that in 1990 subspecialty practice should be even more concentrated in the respective subspecialty than it is at the present time. The subspecialty representatives acknowledged that at that time they believed that for some patients the subspecialist does and should continue to provide broad comprehensive and longitudinal care for selected patients. However, those selected patients should be ones having major disorders in the respective organ system of the subspecialist, as the subspecialty internist should not provide care for an unselected population.

The final estimates of the Nephrology Delphi Panel implied that approximately 3,900 to 4,200 specialists would be required in 1990.

Modeling Panel Review and Changes of Nephrology Panel Estimates

Modeling Panel Review

The Delphi Panel recommendations were provided to the Modeling Panel of GMENAC for review. At several sessions of meetings, the Modeling Panel reviewed each of the major components in the practices of nephrologists and attempted to adjust the responses upon advice of Delphi panelists, the Adult Medical Care Panel, and other internal medicine subspecialty panels. Major changes in estimates were generally made by the Modeling Panel when the reference data and outcomes of the Delphi panelists differed significantly. Usually a more intermediate value was chosen. In other instances, the judgments of the more specialized Delphi Panels (e.g. nephrology) were given preference. Generally, only a few

TABLE 7: AVERAGE LENGTH OF HOSPITAL STAY BY PATIENTS SEEN BY NEPHROLOGISTS AND AVERAGE NUMBER OF VISITS BY NEPHROLOGISTS (1990), AS DETERMINED BY DELPHI PANEL

Condition Groupings	Range for Average Length of Stay (Days)	Range for Average Number of Visits by NE Per day
Infectious and Parasitic Diseases	7.0 - 10.0	1.0
Neoplasms	9.0 - 15.0	1.0 - 1.5
Endocrine, Nutritional and Metabolic Diseases	7.0 - 10.0	1.0
Diseases of the Blood and Blood-forming organs	5.0	1.0
Diseases of the Nervous System and Sense Organs	14.0	1.0
Diseases of the Circulatory System	7.0 - 26.0	1.0
Diseases of the Digestive System	15.0	1.0
Diseases of the Genitourinary System	5.6 - 11.0	1.0
Complications of Pregnancy, Childbirth, and Puerperium	4.2 - 7.0	1.0
Diseases of the Musculoskeletal System and Connective Tissue	10.0 - 15.0	1.0
Congenital Anomalies	5.0 - 10.0	1.0
Symptoms and Ill-defined Conditions	3.5 - 8.0	1.0
Accidents, Poisonings, and Violence	6.0 - 12.0	1.0 - 1.2

estimates were changed in "percent requiring health care in 1990," and then usually downward. Reductions in the norms of care for many morbidity conditions commonly reflected in the Modeling Panel's judgment that a larger number of visits should accrue to subspecialists rather than to generalists.

Such reallocation of visits were based on the assumptions of increased "share-care," as well as sole or total care by the more specialized physicians. For example, in addition to a nephrologist and a primary care physician, a patient with a nephrological condition may also see an endocrinologist, cardiologist, hematologist, urologist, and neurologist for the treatment of other conditions.

Modeling Panel Revisions

The Modeling Panel made several significant changes in the Delphi Panel's estimates based on its considered assessment of service needs to accrue to the nephrologist in 1990. These decisions were founded on several factors, such as more precise treatment in 1990, better care by generalists, earlier diagnoses, and less complicated cases.

The proportion of patients with "other diseases of the kidney and ureter" (ICDA 593) to be seen by the specialty was reduced from 80 percent to 25 percent, and the number of visits required was reduced from 698,703 to 109,172. The proportion of patients with hypertensive disease (ICDA 400-404) to be seen by the nephrologist was reduced from 80 percent to 20 percent with the number of visits changed from 1,852,435 to 463,109. The proportion of patients with nephritis and nephrosis (ICDA 580-584) was reduced from 100 percent to 90 percent, reducing the number of visits from 1,200,896 to 432,323. For this same condition the average number of visits per day was changed from 1.0 to 0.4. Total hospital visits were reduced by the Modeling Panel from 5,735,095 to 3,028,495.

The number of ambulatory visits conducted per week was raised from 50 to 75, to reflect the brief physician input required during visits to dialysis patients, especially when conducted in groups. The number of weeks worked per year was lowered for both the ambulatory and hospital requirements to 47. The net effect of these changes was to reduce workforce requirements by 1,400 to 1,800.

GMENAC Recommendations

The Modeling Panel estimated 2,120 to 2,780 nephrologists to be needed in 1990 and the GMENAC recommended these estimates. Table 8 summarizes the workforce requirements calculations in nephrology.

TABLE 8: SUMMARY OF NEPHROLOGY REQUIREMENTS FOR 1990

AMBULATORY CARE DATA (1990)	(6-30-80) Final Delphi	(7-13-80) Modeling Panel
Total Diagnostic Visits	26,165,186	26,165,186
Total, Non-Delegated Visits	14,507,858 (55%)	14,507,858 (55%)
Simultaneity Factor	(1.90)	(1.90)
Total Non-Delegated Patient Visits	7,635,715	7,635,715
Productivity: (No. weeks x No. visits/wk)	48x50= 2,400	47x75 = 3,525
Basic Number, Patient Care Physicians:	3,182	2,166
Patients < 17 years of age	169 (5% =.053 add on)	56(2.5% = .026 add-on)
Subtotal:	3,351	2,222
General Practice (20% = .250 add-on)	838	556
TOTAL REQUIRED NEPHROLOGISTS	4,189	2,778

Alternate Method of Calculating:

HOSPITAL CARE DATA (1990):		
Total Diagnostic Visits:	5,735,095	3,028,495
Total, Non-Delegated Visits (100%)	5,735,095	3,028,495
Total Non-Delegated Patient Visits:	5,735,095	3,028,495
Productivity: (No. weeks x No. visits/wk)	48x40= 1,920	47x40= 1,880
Basic Number, Patient Care Physicians:	2,987	1,611
Patients <17 years of age	158 (5% = .053 add-on)	85(2.5% = .026 add-on)
Subtotal:	3,145	1,696
General Practice (20% = .250 add-on)	786	424
TOTAL REQUIRED NEPHROLOGISTS	3,931	2,120

Comparison of Projected 1990 Practice Profiles To Empirical Data on 1977 Practice Profiles For Nephrologists

GMENAC, which projected practice profiles for 1990, assessed service requirements for 14 condition groupings; the study of the University of Southern California School of Medicine, Division of Research in Medical Education (USC/DRME), which analyzed 1977 practice profiles, assessed requirements for 16. Both studies assessed 11 of the same groups. Table 9, which shows these future and current profiles, combines ambulatory and hospital data.

Symptoms and ill-defined conditions are anticipated to be the conditions requiring the most service in the future (53.0%), while they currently rank fifth (5.1%). General care was not included as part of the practice profiles for 1977, but is expected to comprise 20 percent of the profiles in 1990. Diseases of the genitourinary system ranked third for the future (12.2 percent), but was the highest ranking condition (43.3 percent) in 1977. Diseases of the circulatory system were estimated to comprise 6.5 percent of the practice profiles in the future, but currently comprise a greater proportion--18.2 percent. Endocrine, nutritional and metabolic diseases currently comprise a greater proportion of the practice profile (5.2 percent) than GMENAC suggests it will in 1990 (3.4 percent). The aforementioned condition groupings represent 95 percent of all conditions in future profiles, but only 77 percent of current profiles.

Effects of a Specialty Oversupply

Nephrology is one of the subspecialties for which an oversupply is estimated. In the context of this paper, an oversupply refers to an excess of the aggregate number of nephrologists relative to the need ascertained for nephrologic care requiring subspecialty expertise. It has been suggested that an oversupply of nephrologists and other practitioners has negative consequences for health care delivery and consumption.

Some economists argue that an increase in the supply of physicians can be beneficial, that is, it will foster competition, lower fees and incomes and make health care services more broadly available. Proponents of a specialty physician surplus have suggested that such a surplus would possibly encourage specialists to schedule more time for each patient, could reduce medical care costs, lessen waiting time for appointments, and ease accessability and availability problems of rural and inner city residents. In addition, proponents of an expansion of the aggregate supply of specialists have indicated that specialists provide a cost-effective treatment because they are capable of treating a large percentage of patients without the necessity of referral or consultation.

One may argue, however, that the market for physician's services is so different from most goods and services that additional economic theory has no place. A number of economists have argued that physicians can and do induce demand for their services to achieve a target rate of income. Studies have indicated that as the number of surgeons increases in an area, the number of operations also increases (Davis, 1981).

TABLE 9: COMPARISON OF 1990 GMENAC SERVICE REQUIREMENTS TO CURRENT PRACTICE PROFILES FOR NEPHROLOGY, BY CONDITION GROUPING

Condition Grouping	Percentage Of Total Practice	
	1990 Data	1977 Data
Infectious and Parasitic Diseases	*	1.5
Neoplasms	0.7	1.9
Endocrine, Nutritional and Metabolic Diseases	3.4	5.2
Diseases of the Blood and Blood Forming Organs	*	0.3
Diseases of the Nervous System and Sense Organs	*	1.2
Diseases of the Circulatory System	6.5	18.2
Diseases of the Digestive System	0.8	3.4
Diseases of the Genitourinary System	12.2	43.3
Complications of Pregnancy, Childbirth, and Puerperium	0.1	-
Diseases of the Musculoskeletal System and Connective Tissue	1.0	2.6
Congenital Anomalies	1.1	-
Symptoms and Ill-Defined Conditions	53.0	5.1
Accidents, Poisonings, and Violence	1.2	4.3
General Care	20.0	-
Mental Disorders	-	0.6
Special Conditions and Examinations Without Sickness	-	5.4
Other Diagnoses **	-	3.0
Diseases of the Respiratory System	-	3.2
Diseases of the Skin and Subcutaneous Tissue	-	0.6
TOTAL	100.0	99.8

SOURCES: 1990 Data - GMENAC Determinations; 1977 Data - Roger A. Girard, et al. "A National Study of Internal Medicine and Its Specialties: I. An Overview of the Practice of Internal Medicine." Annals of Internal Medicine 90 (6 June 1979):973.

* Less than 0.1 percent

** Includes complications of pregnancy, childbirth, and the puerperium; congential anomalies, and certain causes of perinatal morbidity and mortality.

In many physician surplus areas, costs have not necessarily decreased, and it may develop that given an oversupply of providers, aggregate medical costs may increase. Moreover, it is unclear whether training physician specialists rather than generalists will be cost-effective and promote the optimal use of the health care system. Highly specialized physicians cannot practice in rural areas lacking sophisticated support facilities and personnel, and to the extent that physicians generate demand for services, motivations to relocate into inner cities or rural areas are reduced; market forces alone have limited capacity to correct specialty and geographic maldistributions. A balanced specialty mix of physicians is likely to contribute to stabilized costs and improved equitable access to medical care. Access to services may be improved as physicians spill over into relatively underserved areas. However, as costs rise, political pressure for cutting back on programs aiding access may negate these gains.

This issue of oversupply is related to practice profiles, since the manner in which nephrologists practice is a factor in determining the number of these specialists needed to provide care. GMENAC has assumed that the practice profile of nephrologists in 1990 would be influenced by several factors that involved increased interdependence between nephrologists and generalists, decreased/increased rates for certain diseases, and reduced treatment of certain diseases in conjunction with expanded treatment of other diseases.

GMENAC predicted that in 1990 more highly trained generalists will allow nephrologists to shift their practices away from substantial provision of primary care towards increased consultation for generalists and treatment of complex and diagnostically challenging nephrologic diseases. Better trained generalists will be able to treat the great majority of diseases they encounter and will be skilled in recognizing patients requiring referral to nephrologists. Although generalists would have the responsibility for providing the majority of primary care, GMENAC emphasized the importance and desirability of nephrologists providing primary care for selected patients, which would account for 20 percent for both ambulatory and hospital requirements in nephrology. This relatively high estimate of the nephrologist's practice that should be devoted to general medical care is related primarily to home visits to uremic patients. Due to the regularity of such visits over the course of time, nephrologists are in the best position, physically and psychologically, to care for other concomitant or emerging medical conditions.

Unresolved Issues

There are unresolved issues which relate to methodology, technological advances, economic constraints, medical education, the role of nonphysician providers, and productivity. The following is a list of examples of these issues, as noted by GMENAC or respondents to the GMENAC report:

1. The Summary Report of the Graduate Medical Education National Advisory Committee (US Department of Health and Human Services, 1981) advised that the mathematical model for estimating physician requirements for 1990 has an uncertain range of error.

> The designation of either surplus or shortage is believed by GMENAC to be correct; however, the magnitude of the surplus or the shortage is less certain. Some errors can be corrected with an exacting review of the many volumes of data. Other errors will be discovered in the future as experience confirms or refutes the estimates. Meanwhile, GMENAC advised that the numerical size of the aggregate estimates for 1990 be considered tentative until the new methodology developed by GMENAC undergoes critical evaluation (page 20).

2. Because of widely varying clinical severities, disagreement frequently exists among clinicians about the appropriate number of visits necessary to treat a disease.

3. Delphi tabulations may not have sufficiently reflected the fact that a number of patients are referred for possible diagnoses which are then disproven. For example, one might screen ten patients for a given condition before diagnosing this condition in a single patient.

4. The Modeling Panel's reduction in requirements based on the belief that the generalist-internist will be sufficiently trained is questioned by some medical experts.

5. The estimates which the Nephrology Panel made do not include the impact of the pediatric nephrologist on adult nephrology care. To some extent there is an arbitrary distinction made between nephrologists who attend adult patients versus those under 17 or 15 years of age. The estimates did include the impact of pediatric care on adult nephrology requirements.

6. The overwhelming contribution to nephrology practice involves dialysis for patients with chronic renal failure, including those requiring long-term care and those awaiting transplants. Major biomedical breakthroughs in nephritis would exert significant impact on this subspecialty but none appear likely within the present decade.

7. In 1981 the cost to the government for dialysis therapy of ESRD was in excess of $1 billion. In addition many of these patients also collect Federal disability payments. In the currently tightening economic climate, the question arises as to whether there may be some form of restriction for future access to dialysis therapy (Evans, 1981).

8. A better understanding and control of the immune process would have substantial impact on success of the transplantation

process. Under the best of circumstances, however, large numbers of patients would not be candidates for transplants, nor is it possible that they would be able to obtain them.

9. Improvement in home and portable modes of dialysis can significantly influence health care costs and workforce requirements. No form of portable dialysis has had a demonstratable impact on cost to date, although the long-term implication is unclear.

10. The dialysis center is the most significant component of the renal subspecialty structure, generally associated with tertiary institutions. Recently there has been a tendency to develop smaller, satellite centers which are less efficient. These centers may, therefore, undergo other changes by 1990.

11. The role of nonphysician providers is significant in dialysis centers, but health service personnel are also involved in transplant programs as nurse coordinators and organ procurers. Nonphysician providers may also play a significant role in most direct patient contact and by providing assistance with respect to routine follow-up care of patients receiving home dialysis, changing the role of the physician to that of regional supervisor. The future roles of these health care personnel will depend upon future developments in treatment and technology.

12. General or comprehensive nephrologists, as opposed to nephrologists solely preoccupied with dialysis care, may see a significant amount of general medical problems. Thus, the definitive functions of the former group are not currently clear--e.g. will they handle renal emergencies in non-metropolitan areas? Because of separate roles and functions, two training tracks appear to be feasible for the future nephrologist: (1) dialysis and (2) general.

13. To date, computer support to generalists for renal, fluid, and electrolyte disorders has not been successful, resulting in the continuing need for the nephrologist as consultant. This is especially true with respect to the hospital patient, where a large amount of the nephrologist's non-dialysis time involves such consultation. Improved computer support to generalists could reduce the time devoted by the nephrologist to this activity, and alter requirements for 1990.

14. Fewer fellows have entered nephrology programs in recent years, resulting in the tendency for programs to reduce the number of training slots available.

15. Foreign medical graduates (FMGs) constitute a large percentage of nephrology fellows. Legal restrictions and proposals by GMENAC for reductions in FMGs may impact on the number of nephrology fellows. In addition, foreign fellows have little opportunity to practice as nephrologists in their countries of origin and therefore have tended to stay in the United States. These factors could impact on the number of nephrologists in 1990.

16. Impact of advances in hepatitis morbidity results in a high attrition rate among dialysis health providers. Projected imminent development of a hepatitis vaccine may effect a significant reduction in workforce requirements, since the productivity (duration of practice) could be increased for each provider.

17. In addition, the increased number of women in the practice of medicine may have an affect on practice hours. Women have traditionally had greater family responsibilities as well as a greater appreciation of cultural development outside of professional responsibilities. It is unclear at present how the increasing numbers of women entering the medical profession will affect work hours and hence productivity. Future research should consider these changes in work habits, modes and attitudes which physicians in the 1990s are likely to embrace.

18. Another uncertainty is what the results of an oversupply of specialists will be. Fees may be lower, as physicians engage in aggressive competition for business; or they may increase, as physicians attempt to maintain a target income in the face of fewer patients per physician. The quality of care may be improved, as physicians spend more time with patients, turn to preventive care, or substitute their services for those who are less well-qualified. The quality of care may decline, however, as physicians perform unnecessary and high risk procedures, or as the reduced number of procedures per physician reduces physician proficiency.

III. IMPLICATIONS AND MAJOR CONCLUSIONS

The issues addressed by GMENAC will influence nephrology workforce requirements beyond 1990. Because of the state of the art and a lack of uniform data on physician personnel, some of the issues raised by GMENAC may not be resolved or given specific policy formulation until further data can be collated. Perhaps the most important contribution of the GMENAC report is the detailing of a comprehensive process of determining physician workforce requirements utilizing input from private sector clinical practitioners, academicians, as well as government policy makers. GMENAC has suggested that the specific numerical recommendations may change, depending on further study and updated refinements of data.

GMENAC estimated that in 1990, between 2,120 and 2,780 nephrologists will be needed. This estimation is based on several assumptions:

- Increased proportion of end-stage renal disease (ESRD) patients will receive transplants, representing a decreased nephrology workforce need.

- Moderate increase in patient pool may occur as detection programs for essential hypertension continue. Since many patients continue to be under less than optimal control, nephrologists will see some of the more difficult cases, as well as those with renal sequellae. Organizational change may result in specific categorical hypertension facilities which will provide more comprehensive and directed care.

- Increases are likely for iatrogenic renal disorders related to side effects of potent medications.

- More effective treatment modalities resulting in better control of hypertension, diabetes, and drug-related renal disease may reduce the total number of ESRD patients. Seventy-five percent of cases are deemed preventable, including approximately 10 percent due to analgesic abuse.

- Decreases in inappropriate referrals by better trained generalist physicians will probably be offset by increases in appropriate ones. A significant part of the nephrologist's practice will continue to be as the provider of comprehensive diagnostic examinations to rule out possible nephrological etiology or associations, all of which are considered necessary, even when resulting in negative findings.

- Dialysis accounts for the bulk of workforce time and resources in nephrology. Federal reimbursement supports the "dialysis for all" program currently operative, and changes, though likely, tread upon very sensitive ethical, economic, and political concerns.

- Since total reimbursement for the number of patients under dialysis, as manifested by the Federal investment/expenditure appears to be inelastic with respect to the number of nephrologists, position saturation of dialysis jobs may be near. The expectation is that this will lead to increasing numbers of community-based nephrologists, although for various reasons (e.g. fewer FMGs) there may be a cyclical downturn of physicians selecting this subspecialty.

- Factors influencing the future of dialysis programs and physician personnel requirements include the availability and encouragement, through reimbursement incentives, of home dialysis, transplantation, and equipment improvements. The impact of each is unclear at the present time, although increased utilization of home dialysis will probably diminish both requirements and cost. Delegability estimates of 50 percent for uremic disorders are predicated on an expanded availability and use of home and portable dialysis machines.

- Referrals will probably increase with a greater number of clinical nephrologists in the community and greater preventive medicine concerns on the part of primary care practitioners. Currently, however, there is still a tendency for referrals to nephrologists to be delayed until signs of advanced stages of renal dysfunction have developed.

IV. RECOMMENDATIONS

In general, this study highlights the need to direct attention to (1) continued studies on workforce planning, and how they might be conducted; (2) the educational process as a continuum for the general public as well as for physicians; and (3) the need for additional biomedical research, and the lack of physician personnel to conduct it. Specific recommendations include:

1. Nephrology workforce studies must be conducted periodically to update requirements based on technological advancement, changes in policy resulting in a reduction of the population served by dialysis centers, major biomedical breakthroughs in nephritis, hypertension and diabetes mellitus.

2. More organized approaches to continuing education for generalists should be instituted in renal, fluid and electrolyte disorders.

3. More organized approaches to health education/prevention for the general public should be initiated in order to reduce the number of patients with certain conditions. These should be directed to the young and the old--through school programs and the media. They should be multidisciplinary and include the roles of nutrition, exercise, judicious use of medications, and scrupulous personal hygiene.

4. Undergraduate and graduate medical curriculum should place greater emphasis on the role of the physician as health promoter and the responsibility of the patient in prevention of certain medical conditions.

5. Should the GMENAC process be continued, a broad spectrum of nephrology physicians should be represented on future Delphi Panels. A larger number of Delphi panelists would provide greater diversity of judgment and breadth of experience. Panels could also include public health specialists, such as epidemiologists, to facilitate determination of incidence/prevalence rates.

6. The feasibility of instituting dual training tracks should be explored, with the goal to proportionately improve the balance/mix of general nephrologists in the community and with respect to the high ratio of nephrologists concerned primarily with dialysis.

7. Programs should be developed which would encourage highly competent physicians to pursue careers as clinical researchers and academicians, in order to decrease the existing shortage and prevent a future shortage in our teaching institutions.

V. FUTURE DIRECTION OF NEPHROLOGY WORKFORCE REQUIREMENTS

GMENAC recognizes that Nephrology studies should be conducted periodically to keep abreast of technological and other developments which may influence workforce requirements. The effects of future technology on nephrology workforce needs is uncertain. A clearer picture of personnel requirements will emerge as more information on the specific nature of newer technology becomes available. A likely outcome is that certain technological procedures will increase the need for highly trained nephrologists. However this increase may be off-set by generalists trained to provide more care. The end result may be that the overall number of nephrologists needed for 1990 may not change significantly from the present number, but the types of nephrologists needed for 1990 may be different from the types existing today.

APPENDIX 1

ABBREVIATIONS

ABBREVIATIONS

CAPD	Continous ambulatory peritoneal dialysis
DHEW	Department of Health, Education, and Welfare
DHHS	Department of Health and Human Services
ESRD	End-Stage Renal Disease
F1	Fellow, year one
F2	Fellow, year two
F3	Fellow, year three
FMG	Foreign Medical Graduate
GFIM	General practitioner, family practice physician, and general internal medicine physician
GMENAC	Graduate Medical Education National Advisory Committee
HDS	Hopsital Discharge Survey
HIS	Health Interview Survey
ICDA	International Classification of Diseases, Adapted for Use in the United States, Eighth Revision.
NAMCS	National Ambulatory Medical Care Survey

APPENDIX 2

MEMBERS OF GRADUATE MEDICAL EDUCATION
NATIONAL ADVISORY COMMITTEE

MEMBERS OF
GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

CHAIRMAN

TARLOV, Alvin R., M.D.
Professor & Chairman
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

MEMBERS

BARRERA, Carl J., Esq.
Assistant General Counsel
Metropolitan Life Insurance Company
New York, New York

CARBECK, Robert B., M.D.
Executive Vice-President
Catherine McAuley Health Center
Ann Arbor, Michigan

DONALDSON, William F., M.D.
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
Pittsburgh, Pennsylvania

GARCIA, Delores I., M.D.
Chief Resident in Pediatrics
Department of Pediatrics
and Communicable Diseases
University of Michigan
Medical Center
Ann Arbor, Michigan

HAUGHTON, James G., M.D.
Executive Vice-President
Charles R. Drew Postgraduate
Medical School
Los Angeles, California

HERTZOG, Francis C., Jr., M.D.
Chairman, Board of Directors
Memorial Hospital Medical Center
University of California at Irvine
Long Beach, California

LAWTON, Stephan E., Esq.
Pierson, Ball and Dowd
Washington, D.C.

MAGEN, Myron S., D.O.
Dean and Professor of Pediatrics
Michigan State University
College of Osteopathic Medicine
East Lansing, Michigan

MORGAN, Beverly C., M.D.
Chairman
Department of Pediatrics
University of Washington
Seattle, Washington

NESBITT, Tom E., M.D.
Urologist, Private Practice
Assistant Clinicl Professor Urology
Vanderbilt University
Nashville, Tennessee

O'ROURKE, Karen G., R.N., M.S.
National Representative
Federation of Nurses and
Health Professionals
AFT/AFL-CIO
Washington, D.C.

SPIVEY, Bruce E., M.D.
President
Pacific Medical Center
San Francisco, California

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

MEMBERS (Cont'd)

SPURLOCK, Jeanne, M.D.
Deputy Medical Director
American Psychiatric Association
Clinical Professor Psychiatry
Schools of Medicine
George Washington and
Howard Universities
Washington, D.C.

STAPLES, Eugene L.
Director
West Virginia University
Hospital
Morgantown, West Virginia

STELMACH, W. Jack, M.D.
(First Chairman)
Director
Family Practice Residency
Program
Baptist Memorial Hospital
Kansas City, Missouri

TREVINO, Margarita C., R.N., M.S.
Associate Director of Health
Services for Nursing and
Clinic Operations
Community Health Centers of
Dallas, Inc.
Assistant Professor
Baylor University School of Nursing
Dallas, Texas

WILKINSON, Charles B., M.D.
Executive Director
Greater Kansas City
Mental Health Foundation
Associate Dean
School of Medicine
University of Missouri
Kansas City, Missouri

ZUBKOFF, Michael, Ph.D.
Professor and Chairman
Department of Family
& Community Medicine
Dartmouth Medical School
Professor of Economics
Amos Tuck School of Business
Administration
Dartmouth College
Hanover, New Hampshire

EX OFFICIO FEDERAL MEMBERS

PERMANENT MEMBERS

FOLEY, Henry A., Ph.D.
Administrator
Health Resources Administration
Chairman, Health Manpower
Coordinating Committee, PHS
Department of Health and Human
Services
Hyattsville, Maryland

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

EX OFFICIO FEDERAL MEMBERS (Cont'd)

PERMANENT MEMBERS (cont'd)

MATHER, John, M.D.
Director
Education Service
Veterans Administration
Washington, D.C.

WILSON, Almon C., M.D.
RADM, MC, USN
Commanding Officer
Naval Health Science Educational and Training Command
National Naval Medical Center
Bethesda, Maryland

ALTERNATE MEMBERS

EAST, Paul, M.D.
Chief, Medical/Dental Division
Veterans Administration
Washington, D.C.

TAYLOR, E. Lee, M.D.
CDR, MC, USN
Director, Medical Corps Programs
National Naval Medical Center
Bethesda, Maryland

STAFF

SCHWAB, Paul, M.
Executive Secretary
Graduate Medical Education National Advisory Committee
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

JACOBY, Itzhak, Ph.D.
Staff Director, GMENAC
Director, Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

FORMER MEMBERS

AGUIRRE, Marilyn N.
Project Director
Identity Development and Education for Adolescents
New York, New York

BARCHET, Stephen, M.D.
RADM, MC, USN
(Ex Officio)
Inspector General, Medical
Bureau of Medicine & Surgery
Department of Navy
Washington, D.C.

BURNETT, Mary M., D.O.
General Practitioner
Dallas, Texas

COX, J. William, M.D.
RADM, MC, USN
(Ex Officio)
Asst. Chief for Human Resources and Professional Operations
Bureau of Medicine & Surgery
Department of Navy
Washington, D.C.

DiPRETE, Henry A.
Second Vice-President
John Hancock Mutual Life Ins. Co.
Boston, Massachusetts

FRIEDMAN, Serena M., M.D.
Resident, Emergency Medicine
University of Southern California Medical Center
Los Angeles, California

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

FORMER MEMBERS (Cont'd)

HOGARTY, William R.
Executive Director
Puget Sound Health Systems Agency
Seattle, Washington

HOLDEN, William D., M.D.
Professor and Director
Department of Surgery
Case Western Reserve University
School of Medicine
Cleveland, Ohio

JOHNSON, David W., M.D.
Seattle District Medical Officer
Food and Drug Administration
Department of Health and Human Services
Seattle, Washington

KISTNER, Robert A., D.O., M.D.
Dean of Faculty
Chicago College of Osteopathic Medicine
Chicago, Illinois

LeMAISTRE, Charles A., M.D.
President
The University of Texas System
Cancer Center
Texas Medical Center
Houston, Texas

MARGULIES, Harold, M.D.
(Ex Officio)
Formerly, Deputy Administrator
Health Resources Administration
Currently, Special Assistant for
Environmental Health
Office of the Assistant Secretary of Health
Department of Health and Human Services
Rockville, Maryland

MAYER, William M.D.
(Ex Officio)
Asst. Chief Medical Director for Academic Affairs
Veterans Administration
Washington, D.C.

PITTMAN, James A., Jr., M.D.
Executive Dean
School of Medicine
The University of Alabama in Birmingham
Birmingham, Alabama

WAYBUR, Ann Dr.
Senior Health Care Consultant
Social Security Department
International Union, UAW
Detroit, Michigan

FORMER STAFF

FEATHERSTONE, Frederick V., M.D.
Executive Secretary (GMENAC)
Assistant Director for Planning
Division of Medicine
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland
Currently, Deputy Executive Director
American Academy of Orthopaedic Surgeons
Chicago, Illinois

GRAHAM, Robert, M.D.
Executive Secretary (GMENAC)
Acting Deputy Administrator
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland
Currently, Professional Staff Member
Subcommittee on Health and Scientific Affairs
United States Senate
Washington, D.C.

GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

FORMER STAFF (Cont'd)

McNUTT, David R., M.D., M.P.H.
(Acting Executive Secretary GMENAC)
Director, Office of Graduate Medical
Education
Health Resources Administration
Department of Health and
Human Services
Currently, Deputy Commissioner of Health
City of Chicago
Richard J. Daley Center
Chicago, Illinois

APPENDIX 3

MEMBERS OF GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE MODELING TECHNICAL PANEL

MODELING TECHNICAL PANEL

DONALDSON, William F., M.D.
Clinical Professor
Orthopedic Surgery
University of Pittsburgh
School of Medicine
128 North Craig Street
Pittsburgh, Pennsylvania 15213

STELMACH, W. Jack, M.D.
Director
Family Practice Residency
Program
Baptist Memorial Hospital
6601 Rockhill Road
Kansas City, Missouri 64131

WILKINSON, Charles B., M.D.
Executive Director
Greater Kansas City
Mental Health Foundation
600 East 22nd Street
Kansas City, MO 64108

MORGAN, Beverly C., M.D.
Chair and Professor
Department of Pediatrics
UCI Medical Center
101 City Drive South
Orange, California 92668

NESBITT, Tom E., M.D.
Trustee, AHA and AMA
1921 Hayes Street
Nashville, Tennessee 37203

SPIVEY, Bruce E., M.D.
President
Pacific Medical Center
P.O. Box 7999
San Francisco, California 94120

APPENDIX 4

MEMBERS OF GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

ADULT MEDICAL CARE DELPHI PANEL

MEMBERS OF

ADULT MEDICAL CARE DELPHI PANEL

CONVENERS

TARLOV, Alvin R., M.D.
Professor and Chair
Department of Internal Medicine
Pritzker School of Medicine
University of Chicago
Chicago, Illinois

MAGEN, Myron S., D.O.
Dean and Professor of Pediatrics
Michigan State University
College of Osteopathic Medicine
East Lansing, Michigan

PANELISTS

Family Practice

BLOOM, Sanford, M.D.
Director, Family Practice Residency Program
Santa Monica Hospital Medical Center
Santa Monica, California

EGGER, Ross L., M.D.
Director, Family Practice Residency Program
Ball Memorial Hospital
Muncie, Indiana

JONES, James G., M.D.
Chairman, Department of Family Practice
East Carolina University
School of Medicine
Greenville, North Carolina

NIKOLAUS, Donald G., M.D.
Private Practice
Dunedin, Florida

POTTS, Donald, M.D.
Private Practice
Independence, Missouri

REPPART, John, M.D.
Col., MC, USAF
David Grant USAF Medical Center
Travis AFB, California

RUSCO, Ralph, D.O.
Private Practice
Chicago, Illinois

SCHACKELFORD, Robert, M.D.
Group Practice
Mount Olive, North Carolina

ADULT MEDICAL CARE DELPHI PANEL (Cont'd)

Internal Medicine

BRISTOW, Lonnie R., M.D.
Private Practice
San Pablo, California

BYNNY, Richard, M.D.
Professor of Medicine
Health Science Center
University of Colorado
Denver, Colorado

DAVIES, Nicholas E., M.D.
Private Practice
Atlanta, Georgia

DAVIS, William D., Jr., M.D., F.A.C.P.
Professor of Clinical Medicine
Tulane University
Chairman Emeritus, Department of
Internal Medicine
Ochsner Foundation Hospital
New Orleans, Louisiana

DuPREE, Richard H., M.D.
Private Practice
Haddonfield, New Jersey

WALDMAN, Robert H., M.D.
Professor and Chairman
Department of Medicine
West Virginia University
School of Medicine
Morgantown, West Virginia

Preventive Medicine

SCHOENRICH, Edyth, M.D.
Associate Dean
Johns Hopkins School of Hygiene
and Public Health
Baltimore, Maryland

Nonphysician Health Care Providers

JOYNER, Steven, P.A.
Physician's Assistant in Family
Practice
Dixon Medical Center, Inc.
Ayden, North Carolina

MULLINIX, Connie, M.P.H.
Assistant Professor and Family Nurse
Practitioner
University of Wisconsin/Milwaukee
School of Nursing
Milwaukee, Wisconsin

STAFF

JACOBY, Itzhak, Ph.D.
Staff Director, GMENAC
Director, Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

AUMACK, Lewis, Ph.D.
Social Science Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

ROSENSTEIN, Judy, M.H.S.A.
Program Analyst
Office of Graduate Medical Education
Health Resources Administration
Department of Health and Human Services
Hyattsville, Maryland

APPENDIX 5

MEMBERS GRADUATE MEDICAL EDUCATION NATIONAL ADVISORY COMMITTEE

NEPHROLOGY DELPHI PANEL

NEPHROLOGY DELPHI PANEL

BLAGG, Christopher, M.D.
Professor of Medicine
University of Washington
School of Medicine
Seattle, Washington

RAPPAPORT, Martin, M.D.
Doctors' Clinic
Webster, Texas

BUCKALEW, Vardaman, Jr., M.D.
Chief, Section on Nephrology
Bowman Gray School of Medicine
Wake Forest University
Winston-Salem, North Carolina

APPENDIX 6

PROCEDURE FOR CALCULATING INTERNAL MEDICINE SUBSPECIALTY AMBULATORY REQUIREMENTS

PROCEDURE FOR CALCULATING INTERNAL MEDICINE SUBSPECIALTY AMBULATORY REQUIREMENTS

I. Referrals from GFIM* Specialists

A. Total Visits

1. I/P Rates (Variable #1) (Col. 3);
2. Multiplied by % Changes (Col. 4 plus 1.00);
3. Multiplied by % Need from HSP* (Col. 5);
4. Multiplied by % to GFIM (Col. 6);
5. Multiplied by % Referred by GFIM (Col. 7);
6. Multiplied by % GFIM Referrals to I.M. Subspecialty (Col. 8);
7. Multiplied by appropriate Population Factors (Aged 17 or more for either Male, Female, or Total);
8. Multiplied by Average Number of Visits (Col. 9).

B. Delegated Visits

Total Visits multiplied by % Delegated (Col. 10).

C. Non-Delegated Visits

Total Visits minus Delegated Visits

II. Practice Based on Sources other than GFIM Referrals (Referrals from non-GFIM specialists, non-medical referrals, "walk-in" etc.)

A. Total Visits

1. Number of patients from GFIM sources (Entry from step I.A. 7);
2. Multiplied by % Patients from non-GFIM Sources (Var. #5) divided by 1.00 minus % SS Patients = $\frac{\% \text{ SS Patients}}{\left(\frac{\text{Col. 11}}{1-\text{Col. 11}}\right)}$
3. Multiplied by Average Number of Visits (Col. 12);

B. Total Visits - Sole Component. This replaces I A and II A where all visits come from non-GFIM sources

1. I/P Rates (Col. 3)
2. Multiplied by % changes (Col. 4 plus 1.00)

* General practice, family practice, internal medicine
** Health Service Provider

3. Multiplied by % Need HSP (Col. 5)

4. Multiplied by % of SS Patients from Non-GFIM Sources (Col. 11)

5. Multiplied by appropriate Population Factors (Aged 17 or more for either Male, Female or Total)

6. Multiplied by Average Number of Visits (Co. 12).

C. Delegated Visits

1. Total Visits multiplied by % Delegated (Col. 13).

D. Non-Delegated Visits

1. Total Visits minus Delegated Visits

III. Total Practice

A. Total Visits

1. Sum of Step I. A. 8. and Step II. A. 3. or Step II. B. 5.

B. Total Delegated Visits

1. Sum of Step I. B. 1. and Step II. C. 1.

C. Total Non-Delegated

1. Step III A minus Step III B.

APPENDIX 7

ABBREVIATIONS FOR ADULT MEDICAL CARE DATA

ABBREVIATIONS FOR ADULT MEDICAL CARE DATA

AMC	=	Adult Medical Care Panel
F	=	Family Practice
G	=	General Practice
GFIM	=	General Practice/Family Practice/Internal Medicine
HIS	=	Health Interview Survey
HSP	=	Health Service Provider
IM	=	Internal Medicine
I/P	=	Incidence/Prevalence
Model	=	Modeling Panel of GMENAC
NAMCS	=	National Ambulatory Medical Care Survey
NE	=	Nephrology Delphi Panel
NPP	=	Nonphysician provider
SS	=	Subspecialty

APPENDIX 8

AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY

PART I

APPENDIX 8

AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY
PART I

MEDICAL CONDITIONS	2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/ Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
I. INFECTIVE & PARASITIC DISEASES (000-136)									
b. Tuberculosis (010-019)									
019 Late effects of tuberculosis	NAMCS	6		#					
	AMC Model.	2	0	100	80	70			
	NE Model.	2	0	100	80	70	1	2.0	5
a. Other infective and parasitic diseases (130-136)									
135 Sarcoidosis	HIS	15		100					
	AMC Model.	15	0	100	90	10			
	NE Model.	15	0	100	90	30	1	4.0	0
II. NEOPLASMS (140-239)									
e. Malignant neoplasm of genito urinary organs (180-189)									
189 Malignant neoplasms of other and unspecified urinary organs	HIS	34		100					
	AMC Model.	*	*	100	*	*			
	NE Model.	34	-15	100	95	100	5	4.0	0

Data not available.
* Not judged as a separate 3-digit item.

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
	g. Neoplasms of lymphatic and hematopoietic tissue (200-209)									
	200 Lymphosarcoma and reticulum-cell sarcoma	HIS	2		100					
		AMC Model.	33	0	100	90	90			
		NE Model.	33	0	100	90	90	1	2.0	0
	201 Hodgkin's disease	HIS	13		100					
		AMC Model.	19	0	100	90	90			
		NE Model.	19	0	100	90	90	1	2.0	0
	202 Other neoplasms of lymphoid tissue	HIS	13		100					
		AMC Model.	13	10	100	90	90			
		NE Model.	13	10	100	90	90	1	2.0	0
	203 Multiple myeloma	HIS	2		100					
		AMC Model.	18	0	100	90	95			
		NE Model.	18	0	100	90	95	1	2.0	0
	204 Lymphatic leukemia	HIS	3		100					
		AMC Model.	45	0	100	90	80			
		NE Model.	45	0	100	90	80	1	2.0	0

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
	R-20 Residuals 205 Myeloid leukemia, 206 Monocytic leukemia, 207 Other and unspecified leukemia, 208 Polycythemia vera, 209 Myelofibrosis	HIS	27		100					
		AMC Model.	50	0	100	80	90			
		NE Model.	50	0	100	80	90	1	2.0	0
III.	ENDOCRINE, NUTRITIONAL, AND METABOLIC DISEASES (240-279)									
	b. Diseases of other endocrin glands (250-258)									
	250 Diabetes mellitus	HIS	3,157		100					
		AMC Mod.	4,000	10	100	95	5			
		NE Mod.	4,000	10	100	95	25	1	3.0	0
	252 Diseases of parathyroid gland	HIS	1		100					
		AMC Mod.	10	0	100	95	95			
		NE Mod.	10	0	100	95	95	5	1.0	0
	253 Diseases of pituitary gland	HIS	5		100					
		AMC Mod.	10	5	100	90	75			
		NE Mod.	5	0	100	90	75	1	2.0	0
	255 Diseases of adrenal glands	HIS	6		100					
		AMC Mod.	6	0	100	90	60			
		NE Mod.	6	0	100	90	60	1	2.0	0

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnosis	2/ Data Source	3/ Incidence-Prevalence (Rate/100,000)	4/ Percent Change 1977-90	5/ Percent Requiring Medical Care	6/ Percent Seen by GFIM	7/ Percent Referred by GFIM	Patients from GFIM Referred: 8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
	d. Other metabolic diseases (270-279)									
	R25 Residual: Congenital Disorder Metabolic	HIS	70		100					
	270 Congenital disorders of amino-acid metabolism	AMC Mod.	70	0	100	85	65			
	271 Congenital disorders of carbohydrate metabolism	NE Mod.	70	0	100	85	65	1	2.0	0
	272 Congenital disorders of lipid metabolism									
	273 Other and unspecified congenital disorders of metabolism									
	274 Gout	HIS	1,080		95					
		AMC Mod.	1,080	2	100	95	5			
		NE Mod.	1,080	-5	100	95	5	40	2.0	0
	R26 Residuals									
	275 Plasma protein abnormal	HIS	427		83					
	276 Amyloidosis	AMC	2,000	0	100	90	5			
	278 Other hyperalimentation	Mod.	500							
	279 Other & unspecified metabolic diseases	NE Mod.	427	0	100	90	25	30	2.0	0
VI.	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (320-389)									
	c. Other Dis. Central Nerv. Sys. (340-349)									
	C08 Composite: Paralyses	HIS	141		97					
	342 Paraylsis agitans	AMC	141	0	100	90	30			
	343 Cerebral spastic infantile paralysis	Mod.								
	344 Other cerebral paralysis	NE Mod.	141	0	100	90	50	1	2.0	0

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnosis	2/ Data Source	3/ Incidence-Prevalence (Rate/100,000)	4/ Percent Change 1977-90	5/ Percent Requiring Medical Care	6/ Percent Seen by GFIM	7/ Percent Referred by GFIM	Patients from GFIM Referred 8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
VII.	DISEASES OF THE CIRCULATORY SYSTEM (390-458)									
	c. Hypertensive Disease (400-404)									
	401 Essential benign hypertension	HIS	9,756		99					
		AMC	15,000	10	100	98	1			
		Mod.	13,636		99					
		NE	15,000	10	100	98	3	50	2.0	25
		Mod.								
	R39 Residuals									
	400 Malignant hypertension	HIS	67		100					
	403 Hypertension renal disease	AMC	70	0	100	90	30			
	404 Hypertension heart & renal dis.	Mod.								
		NE	70	-10	100	90	50	50	4.0	0
		Mod.								
	g. Dis. of Arteries, Arterioles, & Capillaries (440-448)									
	440 Arteriosclerois	HIS	583	100						
		AMC	583	0	100	95	10			
		Mod.								
		NE	583	0	100	95	10	1	2.0	0
		Mod.								
	446 Polyarteritis nodosa & all. cond.	HIS	4		100					
		AMC	4	0	100	90	20			
		Mod.								
		NE	4	0	100	90	50	50	4.0	0
		Mod.								

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnosis	2/ Data Source	3/ Incidence-Prevalence (Rate/100,000)	4/ Percent Change 1977-90	5/ Percent Requiring Medical Care	6/ Percent Seen by GFIM	7/ Percent Referred by GFIM	Patients from GFIM Referred: 8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
IX.	DISEASES OF DIGESTIVE SYSTEM (520-577)									
	f. Diseases of Liver, Gallbladder, & Pancreas (570-577)									
	571 Cirrhosis of Liver	HIS	144		98					
		AMC Mod.	144	10	100	95	20			
		NE Mod.	144	10	100	95	20	1	2.0	0
X.	DISEASES OF GENITOURINARY SYSTEM (580-629)									
	a. Nephritis and Nephrosis (580-584)									
	R54 Residuals 580 Acute nephritis 581 Nephrotic syndrome 582 Chronic nephritis 583 Nephritis, unqualified 584 Renal sclerosis, unqualified	HIS	85		98					
		AMC Mod.	85	0	100	95	30			
		NE Mod.	85	0	100	85	80	100	3.0	0
	b. Other Diseases of Urinary System (590-599)									
	590 Infections of kidney	HIS	2,271		100					
		AMC Mod.	2,271	0	100	95	10			
		NE Mod.	2,271	0	100	95	10	10	2.0	0
	592 Calculus of kidney and ureter	HIS	464		99					
		AMC Mod.	464	0	100	90	50			
		NE Mod.	464	0	100	90	50	30	1.0	0

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
R55 Residuals										
593	Other diseases of kidney and ureter	HIS	2,382		95					
594	Calculus of other parts of urinary system	AMC	2,382	0	100	90	20			
596	Other diseases of bladder	Mod.								
599	Other diseases of urinary tract	NE	2,382	0	100	90	50	50	1.0	0
		Mod.								
XI. COMPLICATIONS PREGNANCY, CHILDBIRTH, & PUERPERIUM (630-678)										
b. Urinary infection & Toxemias of Pregnancy & Puerperium (635-639)										
R60 Residuals only										
635	Urinary infection arising during pregnancy & puerperium	HIS	169		66					
638	Hyperemesis gravidarum	AMC	169	0	100	60	40			
		Mod.								
		NE	169	0	100	60	40	10	1.0	0
		Mod.								
XIII. DIS MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE (710-738)										
a. Arthritic & Rheumatic, Except Rheumatic Fever (710-718)										
712	Rheumatoid arthritis & allied conditions	HIS	284		98					
		AMC	284	0	100	90	10			
		Mod.	325	5	90					
		NE	284	0	100	90	10	1	0	
		Mod.								

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		2/	3/	4/	5/	6/	7/	Patients from GFIM Referred		
ICDA 1/	Diagnosis	Data Source	Incidence-Prevalence (Rate/100,000)	Percent Change 1977-90	Percent Requiring Medical Care	Percent Seen by GFIM	Percent Referred by GFIM	8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
	c. Other Diseases of Musculoskeletal System (730-738)									
	734 Diffuse diseases of connective tissue	HIS	14		100					
		AMC	14	0	100	90	20			
		Mod.	50	12						
		NE	56	0	100	90	50	50	3.0	0
		Mod.								
XIV	CONGENITAL ANOMALIES (740-759)									
	R70 Residuals									
	740 Anencephalus;	HIS	131		98					
	741 Spina bifida	AMC	131	0	100	55	50			
	743 Other congenital anomalies,	Mod.								
	nervous system;	NE	131	0	100	55	50	10	2.0	0
	744 Congenital anomalies, eye;	Mod.								
	747 Other congenital anomalies circulatory system									
	750 Other congenital anomalies upper alimentary tract									
	751 Other congenital anomalies, digestive system									
	752 Congenital anomalies, genital organs									
	753 Congenital anomalies, urinary system									
	754 Clubfoot, congenital									
	755 Other congenital anomalies of limbs									
	756 Other congenital anomalies, musculoskeletal system									
	757 Congenital anomalies of skin, hair, & nails									
	758 Other and unspecified congenital anomalies									
	759 Congenital syndromes affecting multiple systems									

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnosis	2/ Data Source	3/ Incidence-Prevalence (Rate/100,000)	4/ Percent Change 1977-90	5/ Percent Requiring Medical Care	6/ Percent Seen by GFIM	7/ Percent Referred by GFIM	Patients from GFIM Referred 8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
XVI SYMPTOMS & ILL-DEFINED CONDITIONS (780-789)										
	a. Symptoms Referable to Systems or Organs (780-789)									
	C17 Composite: Genitourinary system	HIS	204		85					
	786 Symptoms referable to genito-urinary system	AMC	204	0	90	95	5			
		Mod.				10				
	789 Abnormal urinary constituents of unspecified cause	NE	204	0	90	95	5	50	1.0	0
		Mod.								
	b. Senility & Ill-Defined Diseases (790-796)									
	792 Uremia	HIS	7		100					
		AMC	*	*	*	*	*			
		Mod.	*	*	*	*	*			
		NE	35	33	100	75	100	100	90.0	50
		Mod.								

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnosis	2/ Data Source	3/ Incidence-Prevalence (Rate/100,000)	4/ Percent Change 1977-90	5/ Percent Requiring Medical Care	6/ Percent Seen by GFIM	7/ Percent Referred by GFIM	Patients from GFIM Referred 8/ Percent Referred to NE	9/ Average Number of Visits	10/ Percent Visits to NPP
XVII.	ACCIDENTS, POISONINGS, & VIOLENCE (NATURE OF INJURY) (800-999)									
	q. Adverse Effect Medic. Agents (960-979)									
	C31 Composite only: Adverse effect of	HIS	1,294		97					
	960 Antibiotics	AMC	1,294	10	100	90	5			
	961 Other anti-infectives	Mod.								
	962 Hormones & synthetic substitutes	NE	1,294	0	100	90	5	10	2.0	0
	963 Primarily systemic agents	Mod.								
	965 Analgesics & antipyretics									
	966 Anticonvulsants									
	967 Other sedative & hypnotics									
	970 Psychotherapeutics									
	972 Agents primarily affecting autonomic nervous system									
	973 Agents primarily affecting cardiovascular system									
	974 Drugs primarily affecting gasdrointestinal system									
	975 Diuretics									
	976 Agents acting directly upon musculoskeletal system									
	977 Other & unspecified drugs									
	r. Toxic Effect of Substances Chiefly Nonmedicinal as to Source (980-989)									
	C32 Composite only: Toxic effect of	HIS	815		74					
	980 Alcohol	AMC	815	5	100	90	10			
	982 industrial solvents	Mod.								
	984 Lead & its compounds, including fumes	NE	815	0	100	90	10	1	1.0	0
	985 Other metals, chiefly	Mod.								
	GRAND TOTAL: ALL NE CONDITIONS	=								

APPENDIX 9

AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY

PART II

APPENDIX 9

AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY
PART II

ICDA 1/	MEDICAL CONDITIONS Diagnoses	Data Source	11/ Patients from Non-GFIM Sources: Percent NE Patients	12/ Patients from Non-GFIM Sources: Average Number of Visits	13/ Patients from Non-GFIM Sources: Percent Visits to NPP	14/ Medical Health Care Visits: Total Required	15/ Medical Health Care Visits: Total Delegated to NPP	16/ Medical Health Care Visits: Percent Delegated	17/ Medical Health Care Visits: Total Required by NE
I. INFECTIVE & PARASITIC DISEASES (000-136)									
	b. Tuberculosis (010-019)								
	019 Late effects of tuberculosis	NAMCS AMC Model.							
		NE Model.	0.5	2.0	5	41	2	5	39
	n. Other infective and parasitic diseases (130-136)								
	135 Sarcoidosis	HIS AMC Model.							
		NE Model.	0.5	4.0	0	296	0	0	296
II.	NEOPLASMS (140-239)								
	e. Malignant neoplasm of genito-urinary organs (180-189)								
	189 Malignant neoplasms of other and unspecified urinary organs	HIS AMC Model.							
		NE Model.	5	4.0	0	10,517	0	0	10,517

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS			11/ Patients from Non-GFIM Sources			14/	15/ Medical Health Care Visits	16/	17/
ICDA 1/	Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
g.	Neoplasms of lymphatic and hematopoietic tissue (200-209)								
	200 Lymphosarcoma and reticulum-cell sarcoma	HIS AMC Model.							
		NE Model.	0.5	2.0	0	978	0	0	978
	201 Hodgkin's disease	HIS AMC Model							
		NE Model.	0.5	2.0	0	563	0	0	563
	202 Other neoplasms of lymphoid tissue	HIS AMC Model.							
		NE Model.	0.5	2.0	0	424	0	0	424
	203 Multiple myeloma	HIS AMC Model.							
		NE Model.	0.5	2.0	0	563	0	0	563
	204 Lymphatic leukemia	HIS AMC Model.							
		NE Model.	0.5	2.0	0	1,185	0	0	1,185

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		11/ Patients from Non-GFIM Sources		13/	14/	15/ Medical Health Care Visits	16/	17/
ICDA 1/ Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
R-20 Residuals 205 Myeloid leukemia, 206 Monocytic leukemia, 207 Other and unspecified leukemia, 208 Polycythemia vera, 209 Myelofibrosis	HIS AMC Model. NE Model.	0.5	2.0	0	1,317	0	0	1,317
III. ENDOCRINE, NUTRITIONAL, AND METABOLIC DISEASES (240-279)								
b. Diseases of other endocrin glands (250-258)								
250 Diabetes mellitus	HIS AMC Mod. NE Mod.	7	4.0	0	37,811	0	0	37,811
252 Diseases of Parathyroid gland	HIS AMC Mod. NE Mod.	0.5	3.0	0	833	0	0	833
253 Diseases of pituitary gland	HIS AMC Mod. NE Mod.	0.5	4.0	0	126	0	0	126
255 Diseases of adrenal glands	HIS AMC Mod. NE Mod.	0.5	4.0	0	119	0	0	119

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnoses	Data Source	11/ Patients from Non-GFIM Sources: Percent NE Patients	12/ Average Number of Visits	13/ Percent Visits to NPP	14/ Medical Health Care Visits: Total Required	15/ Total Delegated to NPP	16/ Percent Delegated	17/ Total Required by NE
	d. Other metabolic diseases (270-279)								
	R25 Residual: Congenital Disorder Metabolic	HIS							
	270 Congenital disorders of amino-acid metabolism	AMC Mod. NE Mod.	0.5	4.0	0	1,422	0	0	1,422
	271 Congenital disorders of carbohydrate metabolism								
	272 Congenital disorders of lipid metabolism								
	273 Other and unspecified congenital disorders of metabolism								
	274 Gout	HIS AMC Mod. NE Mod.	0.5	4.0	0	35,827	0	0	35,827
	R26 Residuals								
	275 Plasma protein abnormal	HIS							
	276 Amyloidosis	AMC							
	278 Other hyperalimentation	Mod.							
	279 Other & unspecified metabolic diseases	NE Mod.	0.5	4.0	0	105,942	0	0	105,942
VI.	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (320-389)								
	c. Other Dis. Central Nerv. Sys. (340-349)								
	C08 Composite: Paralyses	HIS							
	342 Paraylsis agitans	AMC							
	343 Cerebral spastic infantile paralysis	Mod. NE Mod.	0.5	4.0	0	2,332	0	0	2,332
	344 Other cerebral paralysis								

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		11/ Patients from Non-GFIM Sources			14/	15/ Medical Health Care Visits	16/	17/
ICDA 1/ Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
VII. DISEASES OF THE CIRCULATORY SYSTEM (390-458)								
c. Hypertensive Disease (400-404)								
401 Essential benign hypertension	HIS AMC Mod. NE Mod.	0.5	4.0	25	891,530	222,883	25	668,647
R39 Residuals 400 Malignant hypertension 403 Hypertension renal disease 404 Hypertension heart & renal dis	HIS AMC Mod. NE Mod.	5	9.0	0	115,385	0	0	115,385
g. Dis. of Arteries, Arterioles, & Capillaries (440-448)								
440 Arteriosclerois	HIS AMC Mod. NE Mod.	0.5	3.0	0	2,031	0	0	2,031
446 Polyarteritis nodosa & all. cond.	HIS AMC Mod. NE Mod.	8	9.0	0	7,832	0	0	7,932

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		11/ Patients from Non-GFIM Sources			14/	15/ 16/ Medical Health Care Visits		17/
ICDA 1/ Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
IX. DISEASES OF DIGESTIVE SYSTEM (520-577)								
f. Diseases of Liver, Gallbladder, & Pancreas (570-577)								
571 Cirrhosis of Liver	HIS AMC Mod.							
	NE Mod.	0.5	4.0	0	1,106	0	0	1,106
X. DISEASES OF GENITOURINARY SYSTEM (580-629)								
a. Nephritis and Nephrosis (580-584)								
R54 Residuals 580 Acute nephritis 581 Nephrotic syndrome 582 Chronic nephritis 583 Nephritis, unqualified 584 Renal sclerosis, unqualified	HIS AMC Mod.							
	NE Mod.	15	6.0	0	426,864	0	0	426,864
b. Other Diseases of Urinary System (590-599)								
590 Infections of kidney	HIS AMC Mod.							
	NE Mod.	2.5	4.0	0	82,538	0	0	82,538
592 Calculus of kidney and ureter	HIS AMC Mod.							
	NE Mod.	1	3.0	0	117,430	0	0	117,430

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		11/ Patients from Non-GFIM Sources			14/	15/ 16/ Medical Health Care Visits		17/
ICDA 1/ Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
R55 Residuals								
593 Other diseases of kidney and ureter	HIS							
594 Calculus of other parts of urinary system	AMC Mod.							
596 Other diseases of bladder	NE	10	3.0	0	1,300,243	0	0	1,300,243
599 Other diseases of urinary tract	Mod.							
XI. COMPLICATIONS PREGNANCY, CHILDBIRTH, & PUERPERIUM (630-678)								
b. Urinary infection & Toxemias of Pregnancy & Puerperium (635-639)								
R60 Residuals only								
635 Urinary infection arising during pregnancy & puerperium	HIS							
638 Hyperemesis gravidarum	AMC Mod.							
	NE	25	3.0	0	7,707	0	0	7,707
	Mod.							
XIII. DIS MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE (710-738)								
a. Arthritic & Rheumatic, Except Rheumatic Fever (710-718)								
712 Rheumatoid arthritis & allied conditions	HIS							
	AMC Mod.							
	NE	0.5	3.0	0	472	0	0	472
	Mod.							

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS			11/ Patients from Non-GFIM Sources			14/	15/ Medical Health Care Visits	16/	17/
ICDA 1/	Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
	c. Other Diseases of Musculoskeletal System (730-738)								
	734 Diffuse diseases of connective tissue	HIS AMC Mod. NE Mod.	5	6.0	0	76,018	0	0	76,018
XIV	CONGENITAL ANOMALIES (740-759)								
	R70 Residuals 740 Anencephalus; 741 Spina bifida 743 Other congenital anomalies, nervous system; 744 Congenital anomalies, eye; 747 Other congenital anomalies circulatory system 750 Other congenital anomalies upper alimentary tract 751 Other congenital anomalies, digestive system 752 Congenital anomalies, genital organs 753 Congenital anomalies, urinary system 754 Clubfoot, congenital 755 Other congenital anomalies of limbs 756 Other congenital anomalies, musculoskeletal system 757 Congenital anomalies of skin, hair, & nails 758 Other and unspecified congenital anomalies 759 Congenital syndromes affecting multiple systems	HIS AMC Mod. NE Mod.	10	4.0	0	16,023	0	0	16,023

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

MEDICAL CONDITIONS		11/ Patients from Non-GFIM Sources			14/	15/ Medical Health Care Visits		17/
ICDA 1/ Diagnoses	Data Source	Percent NE Patients	Average Number of Visits	Percent Visits to NPP	Total Required	Total Delegated to NPP	Percent Delegated	Total Required by NE
XVI SYMPTOMS & ILL-DEFINED CONDITIONS (780-789)								
a. Symptoms Referable to Systems or Organs (780-789)								
C17 Composite: Genitourinary system	HIS							
786 Symptoms referable to genito-urinary system	AMC							
789 Abnormal urinary constituents of unspecified cause	Mod.							
	NE	1	3.0	0	8,175	0	0	8,175
	Mod.							
b. Senility & Ill-Defined Diseases (790-796)								
792 Uremia	HIS							
	AMC							
	Mod.							
	NE	75	90.0	50	22,868,886	11,434,443	50	11,434,443
	Mod.							

AMBULATORY ADULT MEDICAL CARE: NEPHROLOGY

ICDA 1/	MEDICAL CONDITIONS Diagnoses	Data Source	11/ Patients from Non-GFIM Sources: Percent NE Patients	12/ Average Number of Visits	13/ Percent Visits to NPP	14/ Medical Health Care Visits: Total Required	15/ Total Delegated to NPP	16/ Percent Delegated	17/ Total Required by NE
XVII.	ACCIDENTS, POISONINGS, & VIOLENCE (NATURE OF INJURY) (800-999)								
	q. Adverse Effect Medic. Agents (960-979)								
	C31 Composite only: Adverse effect of	HIS							
	960 Antibiotics	AMC							
	961 Other anti-infectives	Mod.							
	962 Hormones & synthetic substitutes	NE	0.5	2.0	0	21,297	0	0	21,297
	963 Primarily systemic agents	Mod.							
85	965 Analgesics & antipyretics								
	966 Anticonvulsants								
	967 Other sedative & hypnotics								
	970 Psychotherapeutics								
	972 Agents primarily affecting autonomic nervous system								
	973 Agents primarily affecting cardiovascular system								
	974 Drugs primarily affecting gasdtrointestinal system								
	975 Diuretics								
	976 Agents acting directly upon musculoskeletal system								
	977 Other & unspecified drugs								
	r. Toxic Effect of Substances Chiefly Nonmedicinal as to Source (980-989)								
	C32 Composite only: Toxic effect of	HIS							
	980 Alcohol	AMC							
	982 industrial solvents	Mod.							
	984 Lead & its compounds, including fumes	NE	0.5	3.0	0	1,355	0	0	1,355
	985 Other metals, chiefly	Mod.							
	GRAND TOTAL: ALL CONDITIONS	NE				26,165,186	11,657,328	45	14,507,858

APPENDIX 10

FOOTNOTES TO AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY

FOOTNOTES TO AMBULATORY ADULT MEDICAL CARE DATA: NEPHROLOGY

Ambulatory Adult Medical Care: All data refer to the subset of the total U.S. population aged 17 years or older. Medical practice requirements for the younger population are accounted for later by means of an estimated add-on. Hospital care requirements are accounted for later by means of total productivity estimates.

1/ International Classification of Diseases, Adapted for Use in the United States, Eight Revision (ICDA): Currently the most commonly accepted international categorical classification system for medical diseases. Most Internal Medicine subspecialty panels utilized the "3-digit" level of aggregation (e.g. 019, 135, etc.), with occasional use of the "4-digit" level.

2/ Data Source: Data relating to various parameters of medical practice requirements were obtained from the following sources.

Reference data: Major empirical survey data included the Health Interview Survey (HIS), National Ambulatory Medical Care Survey (NAMCS), or others specific in subsequent footnotes.

Adult Medical Care Delphi Panel (AMC): Judgments made by the Adult Medical Care Delphi Panel served both to determined General/Family Practice and General Internal Medicine requirements and to provide additional reference data to the I.M. subspecialty panels.

Nephrology Delphi Panel (NE): Judgments made by NE representatives based on a consideration of the reference and AMC data.

Modeling Panel (Model): The GMENAC "Modeling Panel" assumed the responsiblity for changing any Delphi panel judgments it considered in error. This applied to both the AMC and NE Panel estimates. In order to highlight the comparisons, only the Modeling Panel changes are recorded below the respective panel judgments.

3/ Incidence/Prevalence, Rate per 100,000: Composite of incidence and prevalence data, primarily from HIS; all HIS data pro-rated to base year of 1977, necessitated by special chronic surveys of different body system/disease groupings in different years.

NAMCS data presented in absence of HIS data; other data presented in addition when presumed more valid.

Panel estimates based on median judgments of members present at Delphi debates.

4/ Percent Change, 1977-1990: Panel estimates of predicted change in rate from 1977 to 1990; based on projected changes in the population, psychosocial parameters, medical practice, scientific advances, etc.

5/ Percent Requiring Medical Care: Panel estimates of the percent of persons with a given ICDA condition who should be seen by the health care system in 1990.

Reference data, when available from the HIS, indicates the percent of survey respondents who stated they actually saw a physician for the condition under consideration.

6/ Percent Seen by GFIM: The percent of those who should be seen at all by the health care system (reference 5/) who should be seen specifically by General, Family, or General Internal Medicine Practitioners (1990).

7/ Percent Referred by GFIM: The percent of persons seen by GFIM physicians (reference 6/) who should be referred elsewhere (1990).

8/ Percent GFIM Referrals to Nephrology: The percent of persons referred by GFIM (reference 7/) who should be referred specifically to a Nephrologist (1990).

9/ Average Numbers of Visits to Nephrologist: Panel estimates as to the average number of visits required per year in 1990 to treat a given occurrence of a given ICDA disorder for those patients obtained from GFIM channels.

10/ Percent of NE Visits to Non-Physician Providers (NPP): Panel estimates of the percent of all visits to the Nephrology physician that should be delegated in 1990 to some kind of supervised nonphysician health care provider.

11/ Percent NE Patients from Non-GFIM Sources: Panel estimates of the percent of patients comprising the typical Nephrologist's office practice in 1990 who should come from sources other than GFIM referrals; this percent could include referrals from non-GFIM physicians, referrals from nonphysicians, and "walk-ins."

12/ Average Number of Visits to Nephrologist: Panel estimates of the average number of visits required per year in 1990 to treat a given occurrence of a given ICDA disorder for patients obtained from other than GFIM sources.

13/ Percent of NE visits to Nonphysician (NPP): Panel estimates of the percent of all visits to the Nephrologist that should be delegated in 1990 to some kind of supervised nonphysician health care provider.

Medical Health Care Visits

14/ Total Required: Computation of total number of visits required of Nephrology physicians, directly or indirectly, from all sources.

15/ Total Delegated to NPP: Computation of the total number of visits that the Nephrologists of 1990 should delegate to nonphysician health care providers.

16/ Percent Delegated: A "weighted-average" calculation of delegation estimate from GFIM (reference 8/) and non-GFIM (reference 13/) sources.

17/ Total Required by NE: Computation of the total number of visits that should be handled directly and solely by Nephrology physicians in 1990.

APPENDIX 11

HOSPITAL ADULT MEDICAL CARE DATA: NEPHROLOGY

best copy available

APPENDIX 11

HOSPITAL ADULT MEDICAL CARE DATA: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000 Hospital Discharge Survey 2/ 15+	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ All	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days) Hospital Discharge Survey 6/ 15+	Average Length Stay (Days) IM-SS Panel 7/ All	Average Length Stay (Days) IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Required Medical Health Care Visits: Total NE Visits 10/	Required Medical Health Care Visits: Total Visits Delegated to NPP 11/	Required Medical Health Care Visits: Visits Required by NE Physicians Total Number
I.	INFECTIVE & PARASITIC DISEASE (000-136)													
	d. Other Bacterial Diseases (030-039)	31.7	34.9	31.7	-20	0.5	11.9	10.1	10.0	1.0	0	2,307	0	2,307
	(030) Leprosy													
	(031) Other diseases due mycobacteria													
	(032) Diptheria													
	(033) Whooping cough													
	(034) Streptococcal sore throat & scarlet fever													
	(035) Erysipelas													
	(036) Meningococcal infection													
	(037) Tetanus													
	(038) Stepticemia													
	(039) Other bacterial diseases													
	h. Other Infective and Parasitic Diseases (130-136)													
135	Sarcoidosis	7.5	5.4	7.0	0	1.0	7.9	7.9	7.0	1.0	0	892	0	892

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000 Hospital Discharge Survey 2/ 15+	IM-SS Panel 3/ All	IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days) Hospital Discharge Survey 6/ 15+	IM-SS Panel 7/ All	IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
II.	NEOPLASMS (140-239)													
	e. Malignant neoplasm of genitourinary organs (180-189)													
	Female Disorders (180-184)	132.2	93.3	132.0	0	1.0	9.2	9.2	9.0	1.0	0	21,616	0	21,616
	(180) Malignant neoplasm of cervix uteri													
	(181) Chorionepithelioma													
	(182) Other malignant neoplasm of uterus													
	(183) Malignant neoplasm of ovary, fallopian tube, & broad ligament													
	(184) Malignant neoplasm of other & unspecified female genital organs													
	Male Disorders	67.8	51.4	50.0	-5	1.0	11.9	11.9	10.0	1.0	0	8,643	0	8,643
	(185) Malignant neoplasm: Prostate													
	(186) Malignant neoplasm: of Testis													
	(187) Malignant neoplasm: Other & Unspecified Male Genital Organs													
	Other (188-189)	71.6	57.5	71.6	-10	5.0	11.4	11.1	11.0	1.0	0	64,488	0	64,488
	(188) Malignant neoplasm of Bladder													
	(189) Malignant neoplasm of Other & Unspecified Urinary Organs													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code	Medical Conditions	Hospital Discharge Rate per 100,000					Average Length Stay (Days)				Required Medical Health Care Visits			
		Hospital Discharge Survey 2/		IM-SS Panel 3/	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Hospital Discharge Survey 6/		IM-SS Panel 7/	Average Number NE Visits Per Day 8/	Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
ICDA 1/	Diagnosis	15+	All	17+			15+	All	17+					
	g. Neoplasms of lymphatic and hematopoietic tissue (200-209)													
200	Lymphosarcoma & reticulum-cell sarcoma	16.8	13.3	13.0	0	1.0	14.8	11.5	14.0	1.5	0	4,967	0	4,967
201	Hodgkin's Disease	17.4	13.8	15.0	0	2.0	8.5	8.4	10.0	1.5	0	8,188	0	8,188
202	Other neoplasms of lymphoid tissue	16.2	12.4	15.0	0	1.0	10.3	10.4	10.0	1.5	0	4,094	0	4,094
203	Multiple myeloma	16.8	13.2	15.0	0	1.5	17.9	17.4	15.0	1.5	0	9,211	0	9,211
204	Lymphatic leukemia	10.0	9.8	10.0	0	1.0	9.5	9.0	10.0	1.0	0	1,820	0	1,820
	Other neoplasms: lymphatic & hematopoietic tissue (205-209)	28.6	23.6	25.0	0	1.0	11.2	10.9	11.0	1.0	0	5,004	0	5,004
	(205) Myeloid Leukemia													
	(206) Monocytic Leukemia													
	(207) Other & Unspecified Leukemia													
	(208) Polycythemia Vera													
	(209) Myelofibrosis													
III.	ENDOCRINE, NUTRITIONAL, AND METABOLIC DISEASES (240-279)													
	b. Disease of other endocrine glands (250-258)													
250	Diabetes mellitus	342.9	270.7	300.0	2	5.0	9.9	9.8	10.0	1.0	0	278,289	0	278,389

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000 Hospital Discharge Survey 2/ 15+	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ All	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days) Hospital Discharge Survey 6/ 15+	Average Length Stay (Days) IM-SS Panel 7/ All	Average Length Stay (Days) IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Required Medical Health Care Visits: Total NE Visits 10/	Required Medical Health Care Visits: Total Visits Delegated to NPP 11/	Required Medical Health Care Visits: Visits Required by NE Physicians Total Number
252	Diseases of parathyroid gland	7.5	5.5	8.0	1	5.0	10.0	10.3	10.0	1.0	0	7,351	0	7,351
253	Diseases of pituitary gland	5.6	5.2	5.2	0.5	5.0	11.8	10.5	10.0	1.0	0	4,754	0	4,754
255	Disease of adrenal glands	6.2	5.2	5.0	0	5.0	10.0	9.4	10.0	1.0	0	4,549	0	4,549
	d. Other metabolic disease (270-279)													
(270)	Congenital disorders of amino-acid metabolism	24.9	24.0	24.0	0	50.0	8.2	8.0	8.0	1.0	0	174,676	0	174,676
(271)	Congenital disorders of carbohydrate metabolism													
(272)	Congenital disorders of lipid metabolism													
(273)	Other and unspecified congenital disorders of metabolism													
(274)	Gout	13.7	10.3	10.0	0	5.0	7.5	7.5	7.0	1.0	0	6,368	0	6,368
(275)	Plasma protein abnormalities	45.7	37.7	40.0	0	10.0	8.2	8.0	8.0	1.0	0	58,225	0	58,225
(276)	Amyloidosis													
(277)	Obesity not specified as of endocrin origin													
(278)	Other hyperalimentation													
(279)	Other and unspecified metabolic diseases													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000			Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days)			Average Number NE Visits Per Day 8/	Required Medical Health Care Visits			
		Hospital Discharge Survey 2/	IM-SS Panel 3/				Hospital Discharge Survey 6/	IM-SS Panel 7/			Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
		15+	All	17+			15+	All	17+					
IV.	DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS (280-289)	40.4	51.4	40.0	0	0.5	6.6	5.3	5.0	1.0	0	1,820	0	1,820
	(286) Coagulation defects													
	(287) Purpura and other hemmorrhagic conditions													
	(288) Agranulocytosis													
	(289) Other disease of blood and blood-forming organs													
VI.	DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (320-324)													
	c. Other diseases of central nervous system (340-349)	47.9	41.9	43.5	0.5	0.5	16.2	15.1	14.0	1.0	0	5,568		5,568
	(342) Paralysis agitans													
	(343) Cerebral spastic infantile paralysis													
	(344) Other cerebral paralysis													
VII.	DISEASES OF THE CIRCULATORY SYSTEM (390-458)													
	c. Hypertensive disease (400-404)	194.8	148.0	180.0	1.0	80.0 (20.0)	7.1	7.1	7.0	1.0	0	1,852,435 (463,109)	0	1,852,435 (463,109)
	(400) Malignant hypertension													
	(401) Essential benign hypertension													
	(402) Hypertensive heart disease													
	(403) Hypertensive renal disease													
	(404) Hypertensive heart and renal disease													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000 Hospital Discharge Survey 2/ 15+	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ All	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days) Hospital Discharge Survey 6/ 15+	Average Length Stay (Days) IM-SS Panel 7/ All	Average Length Stay (Days) IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Required Medical Health Care Visits: Total NE Visits 10/	Required Medical Health Care Visits: Total Visits Delegated to NPP 11/	Required Medical Health Care Visits: Visits Required by NE Physicians Total Number
	e. Other forms of heart disease (420-429)													
421	Acute and subacute endocarditis	4.4	3.4	5.0	0	1.0	26.1	28.9	26.0	1.0	0	2,365	0	2,365
	g. Diseases of arteries, arterioles and capillaries (440-448)													
440	Arteriosclerosis	62.9	48.3	63.0	0	1.0	12.1	12.1	12.0	1.0	0	13,756	0	13,756
444	Arterial embolism and thrombosis	26.8	20.6	25.0	0	1.0	13.2	13.0	15.0	1.0	0	6,823	0	6,823
446	Polyarteritis nodosa and allied conditions	5.6	4.1	5.0	0	80.0	18.4	18.6	20.0	1.0	0	145,563	0	145,563
IX.	DISEASES OF THE DIGESTIVE SYSTEM (520-577)													
	f. Diseases of liver, gallbladder, and pancreas (570-577)													
571	Cirrhosis of liver	65.3	49.8	65.0	2	10.0	13.4	13.3	15.0	1.0	0	180,953	0	180,953
X.	DISEASES OF THE GENITOURINARY SYSTEM (580-629)													
	a. Nephritis and nephrosis (580-584) (580) Acute nephritis (581) Nephrotic syndrome (582) Chronic nephritis (583) Nephritis, unqualified (584) Renal sclerosis, unqualified	60.4	51.8	60.0	0	100.0 (90.0)	11.1	10.5	11.0	1.0 (0.4)	0	1,200,896 (432,323)	0	1,200,896 (432,323)

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000			Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days)			Average Number NE Visits Per Day 8/	Required Medical Health Care Visits			
		Hospital Discharge Survey 2/	IM-SS Panel 3/				Hospital Discharge Survey 6/	IM-SS Panel 7/			Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
		15+	All	17+			15+	All	17+					
	b. Other diseases of urinary system (590-599)													
	590 Infections of kidney	69.1	56.4	75.0	0	10.0	7.6	7.4	8.0	1.0	0	109,172	0	109,172
	592 Calculus of kidney and ureter	109.4	145.8	190.0	0	5.0	5.8	5.8	5.6	1.0	0	96,799	0	96,799
	593 Other disease of kidney and ureter	46.0	43.5	48.0	0	80.0 (25.0)	9.8	8.8	10.0	1.0 (0.5)	0	698,703 (109,172)	0	698,703 (109,172)
XI.	COMPLICATIONS OF PREGNANCY, CHILDBIRTH, AND THE PUERPERIUM (630-534)													
	b. Urinary infections and toxemias of pregnancy and the Puerperium (635-6539)													
	636 Renal disease arising during pregnancy and the puerperium	0.0	0.1	0.1	0	100.0	-	-	7.0	1.0	0	1,274	0	1,274
	637 Pre-eclampsia, eclampsia, and toxemia, unspecified	15.6	11.7	17.5	0	3.0	4.2	4.3	4.2	1.0	0	4,012	0	4,012
XIII.	DISEASES OF THE MUSCULOSKELETAL SYSTEM & CONNECTIVE TISSUE (710-738)													
	a. Arthritis and rheumatism, except rheumatic fever (710-718)													
	712 Rheumatoid arthritis and allied conditions	56.0	44.3	50.0	0	0.5	11.6	11.4	10.0	1.0	0	5,549	0	4,549
	716 Polymyositis & dermatomyositis	3.1	2.4	3.0	0	5.0	15.4	16.0	15.0	1.0	0	4,094	0	4,094

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000: Hospital Discharge Survey 2/ 15+	Hospital Discharge Rate per 100,000: IM-SS Panel 3/ All	Hospital Discharge Rate per 100,000: IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days): Hospital Discharge Survey 6/ 15+	Average Length Stay (Days): IM-SS Panel 7/ All	Average Length Stay (Days): IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Required Medical Health Care Visits: Total NE Visits 10/	Required Medical Health Care Visits: Total Visits Delegated to NPP 11/	Required Medical Health Care Visits: Visits Required by NE Physicians Total Number
	c. Other diseases of musculoskeltal system (730-738)													
	734 Diffuse diseases of connective tissue	13.7	10.6	15.0	0	50.0	10.2	10.2	10.0	1.0	0	136,465	0	136,465
XIV.	CONGENITAL ANOMALIES (740-759)													
	753 Congenital anomalies of genital organs													
	753.0 Renal agenesis	1.9	1.2	1.5	0	50.0	4.6	5.0	5.0	1.0	0	6,823	0	6,823
	753.1 Cystic kidney disease	10.6	9.2	15.0	0	80.0	10.0	9.8	10.0	1.0	0	218,345	0	218,345
	753.2 Obstructive defects of urinary tract	0.6	0.7	0.7	0	1.0	7.0	12.0	7.0	1.0	0	89	0	89
	753.3 Other specified anomalies of kidneys	1.9	1.7	1.6	0	5.0	4.0	5.5	5.0	1.0	0	728	0	728
XVI.	SYMPTOMS AND ILL-DEFINED CONDITIONS (780-796)													
	s. Symptoms referable to systems or organs (780-789)													
	786 Symptoms referable to genitourinary system	28.6	26.5	26.0	0	25.0	5.5	5.1	5.0	1.0	0	59,135	0	59,135
	789 Abnormal urinary constituents of unspecified cause	14.3	12.8	13.0	0	50.0	3.5	3.4	3.5	1.0	0	41,395	0	41,395

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code ICDA 1/	Medical Conditions Diagnosis	Hospital Discharge Rate per 100,000 Hospital Discharge Survey 2/ 15+	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ All	Hospital Discharge Rate per 100,000 IM-SS Panel 3/ 17+	Percent Change 1977-1990 4/	Percent Seen by IM-SS 5/	Average Length Stay (Days) Hospital Discharge Survey 6/ 15+	Average Length Stay (Days) IM-SS Panel 7/ All	Average Length Stay (Days) IM-SS Panel 7/ 17+	Average Number NE Visits Per Day 8/	Required Medical Health Care Visits: Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
	b. Senility and ill-defined diseases (790-796)													
	792 Uremia	2.5	1.9	3.0	0	95.0	8.5	8.5	8.0	1.0	0	41,486	0	41,486
	XVII. ACCIDENTS, POISONINGS, AND VIOLENCE (NATURE OF INJURY) (800-999)													
	o. Burn (940-949)	41.1	47.6	44.5	0	1.5	12.6	11.8	12.0	1.2	0	17,489	0	17,489
	(940) Burn Confined to Eye													
	(941) Burn Confined Face, Head & Neck													
	(942) Burn Confined to Trunk													
	(943) Burn Confined Upper Limb Except Wrist & Hand													
	(944) Burn Confined Wrist(s) & Hand(s)													
	(945) Burn Confined Lower Limb(s)													
	(946) Burn Involving Face, Head, & Neck w. Limb(s)													
	(947) Burn Involving Trunk with Limb(s)													
	(948) Burn Involving Face, Head & Neck, with Trunk & Limb(s)													
	(949) Burn Involving Other & Unspecified Parts													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code	Medical Conditions	Hospital Discharge Rate per 100,000			Percent Change	Percent	Average Length Stay (Days)			Average Number	Required Medical Health Care Visits			
		Hospital Discharge Survey 2/	IM-SS Panel 3/		1977-1990 4/	Seen by IM-SS 5/	Hospital Discharge Survey 6/	IM-SS Panel 7/		NE Visits Per Day 8/	Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total . Number
ICDA 1/	Diagnosis	15+	All	17+			15+	All	17+					
q.	Adverse effect of medicinal agents (960-979)	136.3	114.5	120.0	2	15.0	5.1	4.8	6.0	1.0	0	200,440	0	200,440
	(960) Adverse effect of antibiotics													
	(961) Adverse effect of other anti-infectives													
	(962) Adverse effect of hormones & syntemic substitutes													
	(963) Adverse effect of primarily systemic agents													
	(964) Adverse effect of agents primarily affecting blood constituents													
	(965) Adverse effect of analgesics & antipyretics													
	(966) Adverse effect of anti-convulsants													
	(967) Adverse effect of sedatives & hypnotics													
	(968) Adverse effect of other central nervous system depressants													
	(969) Adverse effect of local anesthetics													
	(970) Adverse effect of psycho-therapeutics													
	(971) Adverse effect of other central nervous system stimulants													
	(972) Adverse effect of agents prim. affecting autonomic nervous system													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code	Medical Conditions	Hospital Discharge Rate per 100,000			Percent Change	Percent	Average Length Stay (Days)			Average	Required Medical Health Care Visits			
		Hospital Discharge Survey 2/		IM-SS Panel 3/	1977-1990 4/	Seen by IM-SS 5/	Hospital Discharge Survey 6/		IM-SS Panel 7/	Number NE Visits Per Day 8/	Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
ICDA 1/	Diagnosis	15+	All	17+			15+	All	17+					
(973)	Adverse effect of agents prim. affecting cardiovascular system													
(974)	Adverse effect of drugs prim. affecting gastro-intestinal system													
(975)	Adverse effect of diuretics													
(976)	Adverse effect of agents act. direct. upon muscu-loskeletal system													
(977)	Adverse effect of other & unspecified drugs													
(978)	Adverse effect of two or more medicinal agents in specified combinations													
(979)	Alcohol in combin. with specified medicinal agents													
r.	Toxic effect of substances chiefly nonmedicinal as to source (980-989)	21.8	25.9	20.0	1	10.0	4.8	4.1	5.0	1.0	0	18,377	0	18,377
(980)	Toxic effect: alcohol													
(981)	Toxic effect: petroleum products													
(982)	Toxic effect: industrial solvents													
(983)	Toxic effect: corrosive aromatics, acids, & caustic alkalis													
(984)	Toxic effect: lead & its compounds (includ. fumes)													

HOSPITAL ADULT MEDICAL CARE: NEPHROLOGY

Code	Medical Conditions	Hospital Discharge Rate per 100,000			Percent Change	Percent	Average Length Stay (Days)			Average Number	Required Medical Health Care Visits			
		Hospital Discharge Survey 2/	IM-SS Panel 3/		1977-1990 4/	Seen by IM-SS 5/	Hospital Discharge Survey 6/	IM-SS Panel 7/		NE Visits Per Day 8/	Percent NE Visits Delegated to NPP 9/	Total NE Visits 10/	Total Visits Delegated to NPP 11/	Visits Required by NE Physicians Total Number
ICDA 1/	Diagnosis	15+	All	17+			15+	All	17+					
(985)	Toxic effect: other metals, chiefly nonmed. as to source													
(986)	Toxic effect: carbon monoxide													
(987)	Toxic effect: other gases, fumes, vapors													
(988)	Toxic effect: noxious foodstuffs													
(989)	Toxic effect: other substances chiefly nonmedicinal as to source													
	TOTAL: NEPHROLOGY											5,735,095	0	5,735,095
	(Modeling Panel)											(3,028,495)	(0)	(3,028,495)

APPENDIX 12

FOOTNOTES TO HOSPITAL ADULT MEDICAL CARE DATA: NEPHROLOGY

FOOTNOTES TO HOSPITAL
ADULT MEDICAL CARE DATA: NEPHROLOGY

Hospital Adult Medical Care: All data refer to the subset of the total U.S. population aged 17 years or older. Medical care requirements for the younger population are accounted for later by means of an estimated add-on. Ambulatory care requirements are accounted for later by means of total productivity estimates.

1/ International Classification of Diseases, Adapted for Use in the United States, Eighth Revision (ICDA): Currently the most commonly accepted international categorical classification system for medical diseases. Most Internal Medicine subspecialty panels utilized the "3-digit" level of aggregation (e.g. 019, 135, etc.), with occasional use of the "4-digit" level.

2/ Hospital Discharge Survey: Reference data for 15+ and "All" years, as presented to NE Delphi and Modeling Panels; reference year is 1977.

3/ IM-SS Panel Estimates: Nephrology Delphi Panel estimates of true 1977 discharge rate; Modeling Panel changes are indicated in parentheses, below the Corresponding IM-SS values.

4/ Percent change, 1977-1990: Panel estimates of predicted change in rate from 1977 to 1990; based on projected changes in the population, psychococial parameters, medical practice, scientific advances, etc.

5/ Percent Seen by IM-SS: The percent of patients hospitalized in 1990 for a particular ICDA who should be seen directly or indirectly by a Nephrologist.

6/ Average Length of Stay (Days): Reference data from Hospital Discharge Survey for 15+ and "All" years; the average number of days that patients with a particular ICDA discharge diagnosis remained hospitalized (1977).

7/ Average Length of Stay (Days): The average number of days that adult patients seen by Nephrologists for a particular ICDA occurrence should be hospitalized in 1990, according to NE Delphi Panel.

8/ Average Number of NE Visits per Day: NE Delphi Panel estimates of the average number of actual hospital visits per day that Nephrologists should provide in 1990 to their patients with a particular ICDA condition.

9/ Percent of NE Visits Delegated to NPP: NE Delphi Panel estimate of the percent of all visits required by Nephrologists that should be delegated in 1990 to some kind of supervised nonphysician health care provider.

10/ Total NE Visits: Computation of total number of visits required of Nephrology physicians, directly or indirectly, from all sources.

11/ Total Visits Delegated to NPP: Computation of the total number of visits that the Nephrologists of 1990 should delegate to nonphysician health care providers.

12/ Total Required by NE: Computation of the total number of visits that should be handled directly and solely by Nephrology physicians in 1990.

REFERENCES

REFERENCES

American Medical Association. Directory of residency training programs accredited by the Liaison Committee on Graduate Medical Education, '80/'81. American Medical Association, Chicago, 1980.

Blagg CR, and Scribner BH. Long-term dialysis: Current problems and future prospects. Am J Med 68:633-35, 1980.

Burton BT and Hirschman GH. Demographic analysis: End stage renal disease and its treatment in the United States. Clin Nephrol 11:47-51, 1979.

Davis K. Implication of an expanding supply of physicians: evidence from a cross-sectional analysis. Presentation at Deans's Lecture, School of Hygiene and Public Health, Johns Hopkins University, 14 May 1981.

Evans RW, Blagg CR, and Bryan FA, Jr. Implications for health care policy--a social and demographic profile of hemodialysis patients in the United States. JAMA 245:487-91, 1981.

Federated Council for Internal Medicine. Federated council for Internal Medicine Statement on Manpower. Ann Int Med 90:108-9, 1979.

Girard RA, Mendenhall, RC, Tarlov AR, Radecki MA, and Abrahamson S. A national study of internal medicine and its specialties: I. An overview of the practice of internal medicine. Ann Int Med 90:965-75, 1979.

Graduate Medical Education National Advisory Committee: Summary Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services. (Vol. I of 7 vols). DHHS, Health Resources Administration, DHHS Publication No. (HRA) 81-651. U.S. Government Printing Office, Washington, DC, 1980.

Gutman RA, Stead WW, and Robinson RR. Physical activity and employment status of patients on maintenance dialysis. N Engl J Med 304:309-13, 1981.

Health Care Financing Administration, Office of Special Programs. End-stage Renal Disease. Second Annual Report to Congress. Department of Health and Human Services. Baltimore, MD, 1980.

Kolata GB. Dialysis after nearly a decade. Science 208:473-76, 1980.

Lee PR and LeRoy LB. Internal medicine manpower: Trends in training programs and policy implications. Ann Int Med 91:307-8, 1979.

Matson S. The cost of compassion. HCFA Forum. 4:3-5, Aug 1980.

Mendenhall RC, Girard RA, Lloyd JS and DeFlorio GP. Nephrology Practice Study Report. DHEW Contract No. HRA 232-78-0160 (and Robert Wood Johnson Foundation), University of Southern California School of Medicine, Division of Research in Medical Education, Los Angeles, 1978.

Mendenhall RC, Tarlov AR, Girard RA, Michel JK, and Radecki SE. A national study of internal medicine and its specialties: II. Primary care in internal medicine. Ann Int Med 91:275-87, 1979.

National Institute of Arthritis, Metabolism and Digestive Diseases. Report of the Coordinating Committee. Volume I: Research needs in nephrology and urology. DHEW Publication No. (NIH) 78-1481, U.S. Department of Health, Education and Welfare, National Institutes of Health, Bethesda, MD, 1978.

Relman AS and Rennie D. Treatment of end-stage renal disease--free but not equal. N Engl J Med 303:996-98, 1980.

Rennie D. Renal rehabilitation--where are the data? N Engl J Med 304:351-52, 1981.

Rettig, RA. Implementing the end-stage renal disease program of Medicare. Rand Corporation, Santa Monica, CA, 1980.

Tarlov AR, Schleiter MK, Weil PA, and The Association of Professors of Medicine Task Force on Manpower. National study of internal medicine manpower: IV. Residency and fellowship training 1977-1978 and 1978-1979. Ann Int Med 91:295-300, 1979.

Tilney NL, Strom TB, Vineyard CB, Merrill JP. Factors contributing to the declining mortality rate in renal transplantation. N Engl J Med 299:1321-25, 1978.

Wechsler H. Handbook of medical specialties. Human Sciences Press, New York, 1976.

Weil PA, Tarlov AR, and Schleiter MK. The national study of internal medicine manpower-final report. University of Chicago, Pritzker School of Medicine, Chicago, 1979.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981 0 — 382-668/7255

blank page